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FACULTY OF EDUCATION
The University of Alberta

Editorship of AJER

This edition of the AJER signals a change of editorship of the Journal. The Publications Committee wishes to thank Dr. Henry W. Hodysh who has served as editor since 1977 and to welcome our new editor, Dr. Doyal Nelson.

Dr. Hodysh guided the Journal through its twenty-fifth year of publication and through some stressful financial periods while maintaining and furthering its reputation as a premier educational publication.

Dr. Nelson is well known to AJER readers through his many contributions to the Journal and to educators in general throughout Alberta and indeed elsewhere for his research, writing, and teaching. He has gained a well deserved reputation as a speaker to be sought out at teacher conventions and professional development activities.

Before joining the Faculty of Education in 1959, Dr. Nelson served as a superintendent, principal, and teacher in Alberta. He has held short term appointments at McGill University, California State University, and the University of Minnesota, where he received his PhD in 1962. He was acting chairman of the Department of Elementary Education in 1968-69. During the 1970's he was particularly active internationally with duties taking him to such countries as Thailand, Japan, and West Germany.

Dr. Nelson has a long-standing interest in his major field, instruction in mathematics, and has conducted research and published widely in the area. The Publications Committee is pleased to have Dr. Nelson as new editor of the AJER and wishes him success with his new responsibilities.

R. C. Bryce, Chairman
Faculty Publications Committee

JANET P. SIMPSON

Alberta West Central Health Unit, Edson

and

JAMES MONROE STEWART

Tennessee State University

Expressive English Syntax in Canadian French-Immersion School Children

The purpose of this study was to examine some specific English expressive syntactic structures in a group of Canadian children enrolled in a French immersion educational program. The home, environmental, and native language of these children was English. Fifty-seven children enrolled in junior kindergarten through third grade participated. The Structured Photographic Language Test (SPLT) was used to evaluate syntax. No significant differences were found on overall mean and group scores for this group and the English monolinguals on whom the test was standardized. Item analyses for types of error revealed group differences. Implications for education and therapy are discussed.

Since 1965, a number of French-immersion programs have been developed and implemented in Canada. In this type of educational setting, children from English-speaking homes and environments have attended schools that offer instruction entirely in the French language. These programs provide an opportunity for students to learn a second language (French) while they are acquiring and mastering their mother tongue (English). Unlike the situation in the United States, where the main objective of bilingual programs is retention of an immigrant's native language, the goal of French immersion programs is to achieve native-like fluency in both languages.

Janet P. Simpson (MS, Tennessee State University, Nashville, 1980) is a speech-language pathologist employed by the Alberta West Central Health Unit in Edson, Alberta. The study reported here is one of several research projects initiated by Ms. Simpson during her graduate matriculation.

James Monroe Stewart received his PhD in Hearing and Speech Sciences from Ohio University (Athens). His primary interests are in speech perception with emphasis in distinctive features and their saliency and psychological reality and in the prevalence of communicative disorders.

Studies have been undertaken to examine the process of these French-immersion children in the areas of English reading, writing, spelling, arithmetic, cognitive skills, and receptive and expressive language skills. Generally, these students demonstrate "deficits" in their receptive and expressive English language abilities for the first several years, but perform at a level similar to that of their English-instructed peers by the third grade. More recent research indicates that these children outperform students in regular English programs by the end of elementary school (Maynard, 1980).

In several longitudinal studies reported by Swain and Barik (1976), long-term deficits in the English language development of French-immersion subjects have not been found. Swain (1978) found that immersion subjects performed consistently poorer than their monolingual peers in English reading and spelling skills through the end of the first grade. Similarly, Marckworth (1978) found that bilingual children lagged behind in the acquisition of English morphological structures, reaching the monolingual norms at a later age/grade level. More recent and related developments have been outlined by Maynard (1980).

French-immersion Programs

Genesee (1979) reported on the scholastic effects of participation in the French-immersion program of the Protestant School Board of Greater Montreal (PSBGM). This program was among the first to be developed in Canada, and is currently the most extensive one in the country. In September 1977, some 9462 children were enrolled in Kindergarten through Grade 11. Longitudinal studies were developed to make between-groups comparisons. English and French control students were matched on the basis of intellectual indices and socioeconomic status (SES).

Typically, the children enrolled in PSBGM and similarly structured programs reported on by Swain (1978) and Sweet (1974) were of normal or above IQ and from English-monolingual, middle SES families. Genesee (1979) found that French-immersion children acquired parity with the English control subjects by Grade 3 in formal testing of all aspects of English language development, except spelling, where parity was obtained by Grade 5. They generally scored lower in reading, word discrimination, spelling, and vocabulary; fewer significant differences were found on tasks not requiring (necessarily) formal literacy, such as listening comprehension, aural decoding, and aural vocabulary and skills. At the same time, results of testing French language skills indicated that the immersion subjects had acquired "native-like" proficiency in these areas, including literacy skills. Other studies on French-immersion in Canada, by Swain (1978) and Sweet (1974), are supportive of these findings.

All aspects of academic achievement, including mathematics, in terms of content material were found by Genesee (1979) to be similar and comparable for both groups. Similar results were obtained by Panunto and White (1979) for native-speaking Italian children who spoke English as a second language. Results of these and related studies indicated no long-term, negative effects in English language development or academic achievement among participants.

The recurrent issue on French immersion is that differences are noted early in the formative years, but disappear as the students progress. What is not clear is whether the differences between the monolingual subjects and those enrolled in immersion programs are a function of program exposure and/or progress or

maturation. More important is the nature and substance of the differences. Miller (1978) generates related dimensions in references to evaluation, assessment, and prognosis. All of these issues are germane to understanding bilingualism, but one issue is more directly related to the present study, which addresses a specific aspect of this problem.

Perspectives on Bilingualism

French-immersion programs are similar to the type of educational placement experienced by immigrants in the United States. For example, there are children whose native language is Spanish, and it is the only language spoken in the home. These children are being educated in a second language, that is, English. In this situation, the children are expected to learn the new language of the school and community; their native language receives no encouragement outside the home. The French-immersion children, on the other hand, are learning a new language that will complement the native language which is reinforced in the home, school, and community. There are, however, important differences between the two educational concepts.

Cummins (1978) discussed several reasons why immersion programs have been successful when other bilingual programs have not. The French-immersion child is participating in an additive bilingual program. The acquisition of a second language is not making the native language less important. The immigrant child is participating in a subtractive bilingual program. The acquisition of a second language is imposed at the expense of the native language. Cummins states that a cognitively and academically beneficial form of bilingualism can be achieved only on the basis of uninhibited development of the native language.

A discussion of the implications and consequences of additive and subtractive programs in bilingualism is beyond the scope of the present paper. The essential points here are (a) the recognition of how the second language is learned, that is, in reference to the native language, (b) its social encouragement, and (c) the environmental influences. These are important variables in the acquisition of a second language in bilingual programs. These variables are confounded for those children whose second language is still in the developmental stages or whose native language is deficient or faulty (see also Glass, 1979; Miller, 1978).

Syntax. Hamayan, Markham, Pelletier and Tucker (1978) examined English-speaking bilinguals in an immersion program for their French language competence. To accomplish this, 60 fourth- and sixth-grade children were tested by sentence repetition or elicited imitation. The bilingual and French monolingual groups each contained 30 children with equal numbers in each grade. By observing errors in the second-language learner, the authors hoped to make inferences about their developmental stages. They felt that the syntactic structures not available in the children's competence would be distorted in their production.

The results indicated that the performance of the bilinguals was different and not as proficient as the French group in their usage of the sentence structures. The difficulty and inefficiency on the task were more profound in the bilingual than the French group. For both groups, sixth graders performed better than fourth graders, which reflects an age-maturity factor. Based on the methodological controls, the authors felt that the differences between the two groups were a function of differing internal grammars. Consistency of use characterized both

groups, but the French-monolingual groups utilized the various syntactic structures like the adult native French-speaker more than the bilingual group.

Ramstad and Potter (1974) investigated the use of receptive vocabulary and receptive and expressive syntax between two groups of children, Nez Percé (North-American Indians) and white children, attending the same kindergarten class. The Nez Percé population was in the process of becoming monolingual (English) and showed a need for English language instruction. Overall, white subjects performed significantly better than the Nez Percé subjects in receptive vocabulary on the Peabody Picture Vocabulary Test (PPVT) by Dunn (1965), and in receptive and expressive language as measured by the Northwestern Syntax Screening Test (NSST) by Lee (1971). The results indicated that the Nez Percé subjects demonstrated linguistic deficiencies in the areas of English prepositions, plurals, possessives, verb tenses, and possessive pronouns.

Braun and Klassen (1971) investigated the oral syntactic structures of bilingual and monolingual children. The monolinguals showed superiority over bilinguals in terms of syntactic flexibility and control. Jorstad (1971) and Spector (1972) found that the syntactic abilities of bilingual children were less well-developed than those of their monolingual peers.

In considering the results of studies investigating the syntax of bilingual children, Glass (1979) found that little information is presently available concerning the development of syntactic patterns of bilingual children. Even less information is available on bilinguals' expressive syntactic abilities (defined by Lee, 1971, 1974; Werner & Kresheck, 1974), that is, subjects' production of syntax as opposed to their competence or comprehension. The present study is an outgrowth of Glass' observation.

The literature on French-immersion programs indicates that there are no long-term deficits academically. On the other hand, the literature indicates few studies which attempt to identify the nature of the shorter-term deficits and/or linguistic interference associated with the language development of bilinguals. The few studies which have been conducted indicate that bilingual children demonstrate deficits in the acquisition of syntactic skills when compared to their monolingual counterparts. However, any conclusions regarding these children must be guarded, since normative data and translated versions of the measuring instruments utilized in these studies have not been standardized for the populations under study (see also Glass, 1979; Miller, 1978).

The purpose of the present study was to compare and to identify the differences in expressive syntax of children enrolled in a French-immersion program in Kirkland Lake, Ontario to English-monolingual children enrolled in a suburban-Chicago school system in the United States. For the latter group, the normative data was compiled and evaluated from the *Structured Photographic Language Test* (SPLT) by Werner and Kresheck (1974), who allowed the use of their data and measuring instrument.

Method

Subjects

Age and grade. Subjects ranged in age from 4-0 to 8-11 and were enrolled in grades junior-kindergarten (JK), Kindergarten (K), 1, 2, and 3 of the French-immersion program. Subjects in JK, K, and grade 1 received all instruction

in the French language. Subjects in grades 2 and 3 received 80% French and 20% English instruction. Subjects in JK and K attended school for half-days only. All subjects entered the program at the JK level. A total of 57 subjects participated in the study. Table 1 shows the distribution of these subjects by age, grade, and sex.

TABLE 1
AGE, SEX, NUMBER, AND GRADE OF FRENCH-IMMERSION SUBJECTS

Age	Sex		n
	M	F	
Junior - Kindergarten (15)			
4-0 to 4-5	2	4	6
4-6 to 4-11	6	2	8
Kindergarten (11)			
5-0 to 5-5	1	2	3
5-6 to 5-11	4	5	9
First Grade (7)			
6-0 to 6-5	1	2	3
6-6 to 6-11	2	1	3
Second Grade (11)			
7-0 to 7-5	3	3	6
7-6 to 7-11	2	2	4
Third Grade (13)			
8-0 to 8-5	3	7	10
8-6 to 8-11	4	1	5
	28	29	57

Note. Number of subjects in parenthesis for grade differs slightly from number in groups for age.

School environment. All subjects attended Central Public School, which is administered by the Kirkland Lake Board of Education and located in a middle SES area of the town. Kirkland Lake is located in northeastern Ontario, about 48 km from the Province of Quebec, with a population of approximately 14,000.

Language background. English was the native language of all subjects and was the primary language spoken in the home. A second language (for example, French, Estonian, Ukrainian, and Polish) was identified by seven parents via questionnaire as being spoken "some of the time" in the home.

Speech, language and hearing screening. The school was in the process of referring students with suspected speech and/or language handicaps to a consulting speech-language pathologist. None of the subjects had been placed on the referral list. In addition, all students were screened for hearing loss by a public health nurse before entering the school system. No subjects were referred for further testing.

Intelligence. The subjects were of normal or above normal intelligence as evidenced by their classroom teachers' identification of satisfactory/unsatisfactory scholastic performance in school.

Other information. An information letter and permission form were sent to each subject's parent, along with a short questionnaire concerning: presence/absence of languages other than English spoken at home, time spent speaking French at home, and time spent watching French television or listening to French radio. The purpose of the questionnaire was to determine the students' general homogeneity. No subjects were excluded as a consequence of evaluating parental responses. These were some of the variables deemed important by Miller (1978).

Measuring Instrument.

Background. The SPLT was developed to assess expressive syntax in the grammatical forms of regular, secondary, auxiliary, and copular verbs; singular and plural nouns; subject, object, possessive, and reflective pronouns; adjectives; articles; conjunctions, contractions, negatives; and prepositions. The test was designed to obtain spontaneous (self-generated) responses from children 4-0 to 8-11 years old. Standardization of the SPLT was conducted on English-monolingual, white, middle-class suburban children. The SPLT is based on linguistic and psycholinguistic studies of children's acquisition of the syntactic, morphophonemic, and semantic rules of adult language.

The visual stimuli are full color photographs of children, adults, and animals in everyday situations and activities. The auditory stimuli consist of specific and brief statements or questions which the examiner gives as the accompanying photograph is presented. Each structure is elicited by an introductory statement and a photograph.

Scope and limit of the SPLT. The test was standardized on 360 children between the ages of 4-0 and 8-11 years. These children came from the middle SES where Standard American English was the sole language spoken. The children came from preschools and schools in the northern Chicago, Illinois area and were of normal intelligence with no evident speech or hearing problems.

The authors reported that preliminary analysis of data of 25 children diagnosed as being language delayed by the SPLT were also diagnosed as significantly language delayed by the Development Sentence Scoring (DSS) Method (Lee, 1974).

Rationale for use. The SPLT was selected because it met the needs of the present study. The purpose of the investigation was to compare and to identify differences in English language usage by French-immersion children relative to a standardized population. The SPLT allowed specific erred grammatical forms to be identified, and established a functional language age and expressive language profile (Werner & Kresheck, 1974). Other reasons for this test's selection were its relatively quick and easy administration and its ability to elicit specific syntactic structures.

Testing environment. The subjects were tested individually in a room separate from the classroom, approximately 4.5 months into the school year. As a matter of convenience, students were tested by class, starting with JK. The subject sat directly across a small table from the examiner. The room was well lit, and the perceived noise level was low.

Evaluation. Each subject was instructed individually after introduction into the testing environment. The following set of instructions was given to each child: "I have some pictures for you to look at. I would like you to tell me some stories about them." The first photograph was then placed in front of the subject. The examiner read the eliciting statement on the response form. The child's response was then recorded in the space provided. If the child did not respond, one prompt (as outlined in the test manual) was given. If still no response, the examiner continued with the next item until all 51 items on the test were completed.

Reinforcement. Verbal reinforcers such as "You're doing a good job"; "I like your stories"; and "Okay" were given at various phases of the test.

Statistical Analysis

The investigation was considered a comparative study between the French-immersion subjects and the normative data published by Werner and Kresheck (1974). The original design of the study called for larger numbers in each age group; practically, this was not possible because of the lack of parental permission and the low number of children enrolled in the program. Results of the study were interpreted by age group because of the maturation variable in syntactic development.

The Fisher's z_r transformation was chosen as the appropriate statistic because the use of multiple t tests and analysis of variance would result in loss of interpretive power due to small sample sizes. The correlation coefficients for the normative data and those derived from the present study were obtained by using the mean response scores and standard deviations for each age group. The limitations of this study warranted a liberal alpha level, which was arbitrarily selected at the 0.05 level.

Results

Table 2 displays the normative data from Werner and Kresheck (1974) and the data acquired from the present study. The table reflects a comparison of the two groups by age. In this investigation, the subjects 4-0 to 4-5 scored a mean correct response of 64. This matches the score for the same age group in the normative data. For the next several age groups, 4-6 through 5-11, the subjects scored below the norms. From the age group of 6-0 and beyond, the subjects equalled or exceeded the normative scores. Generally, the standard deviations associated with the scores of the subjects were higher than those of the normative study. This generality is tempered with the size of the subsamples.

Test of significance. A Fisher's z_r transformation was nonsignificant at the 0.05 level. The nonsignificance was obtained with an $r=-.91$ for the normative data and an $r=-.84$ for the French-immersion subjects. These negative correlation coefficients reflect the relationship between the mean correct responses for the age categories and their respective standard deviations. From the results, it appears that the groups were equivalent.

Item analysis. The percentage of correct responses grouped according to syntactic category and age for the French-immersion subjects is shown in Table 3. The criterion in the item analysis is based upon 90%, which was used with the SPLT. Syntactic categories in the table were generally ordered according to the attainment of criterion. For example, under the syntactic category of Imperative

(items 20 and 21), subjects in the 4-0, 4-6, 5-0, 5-6, 6-0, and 6-6 groups scored 50, 68, 33, 72, 67, and 67% correct, respectively. For the remaining age groups 7-0 to 8-6, subjects scored all items correct. It can be seen from the underscore at the age range of 4-0 to 4-5, that 90% of the subjects from the normative data scored this item correct compared to the 50% for the French-immersion subjects. An examination of the table indicates that, for the syntactic category of Reflexive Pronoun (items 38 and 39), subjects in their respective age ranges scored 0, 6, 16, 11, 0, 33, 25, 62, 42, and 40%. As indicated, subjects in both groups failed to attain criterion by age 8-11.

TABLE 2
A COMPARISON OF WERNER AND KRESHECK (1974)
AND FRENCH-IMMERSION STUDIES WITH MEANS,
STANDARD DEVIATION, AND NUMBER OF SUBJECTS

	Werner & Kresheck ^a			French Immersion		
	$\bar{X}$	SD	n	$\bar{X}$	SD	n
4-0 to 4-5	64	12	15	64	14	6
4-6 to 4-11	74	12	20	68	14	8
5-0 to 5-5	79	9	30	70	11	3
5-6 to 5-11	81	9	62	77	12	9
6-0 to 6-5	80	8	47	82	3	3
6-6 to 6-11	82	9	37	82	9	3
7-0 to 7-5	86	8	53	90	2	6
7-6 to 7-11	88	7	48	91	5	4
8-0 to 8-5	93	5	33	91	7	10
8-6 to 8-11	92	3	15	92	6	5

^a Normative data published with permission of the authors and Janelle Publications.

As a means to (solely) reduce data, items 1 through 6 were excluded from the table. These items, which included prepositions and singular and plural nouns, were excluded because the subjects exceeded the norms. It was felt that no important information would be lost or gained by their inclusion. Table 3 does, however, reflect the other items germane to these grammatical forms and are presented therein.

The statistical analysis revealed no long-term, overall difference between the two groups, but differences in the obtained scores for some of the age categories were noted. Table 2 indicates where the differences lie. It reveals two major trends in the expressive syntactic abilities of the children under study in reference to the normative data. First, the scores of the subjects were similar to or better than the normative data in the areas of prepositions, singular and plural nouns, irregular present tense, past tense, infinitives, conjunctions, and possessive nouns. Second, at least a two-year lag was evident in a number of syntactic structures in achieving the 90% criterion. These structures include: imperatives, negative imperatives, possessive nouns, reflexive pronouns, third person singular present tense, negatives, yes-no interrogatives, and passives.

TABLE 3

PERCENTAGE OF CORRECT RESPONSES OF FRENCH-IMMERSION
SUBJECTS GROUPED IN SYNTACTIC CATEGORIES

Category	Item from SPLT	Age (grouped in 6-month clusters)									
		4-0	4-6	5-0	5-6	6-0	6-6	7-0	7-6	8-0	8-6
Imperative	20,21	<u>50</u>	69	33	72	67	67	100	100	100	100
Negative Imperative	22	67	<u>75</u>	67	100	67	100	100	100	90	100
Possessive Noun	30	83	<u>87</u>	67	89	100	100	83	100	95	100
Reflexive Pronoun	28,29	83	93	67	<u>100</u>	100	100	100	100	100	100
	40	50	<u>50</u>	0	67	33	67	83	100	90	80
Y/N Interrogative	38,39	0	6	16	11	0	33	25	62	42	40*
	43,44	41	56	<u>83</u>	78	100	100	100	100	95	100
	41,42	50	58	50	<u>61</u>	100	83	84	100	100	60
Present (3rd Person Singular)	7,8	91	68	<u>83</u>	67	83	67	83	100	85	100
Future	12	100	50	100	89	<u>100</u>	100	100	100	100	100
	9	67	100	<u>67</u>	78	100	100	100	100	100	80
Conjunction	11	50	62	67	<u>78</u>	100	100	100	75	90	80
	25	83	50	<u>100</u>	100	100	67	100	100	100	100
Infinitive + Different Subject	23,24	75	81	83	<u>100</u>	100	100	100	100	100	100
	33	67	75	100	<u>89</u>	100	100	100	100	100	100
Negative	35,36	8	63	16	<u>61</u>	16	67	91	100	90	100
	34	83	100	100	100	67	100	83	100	<u>90</u>	60
Past	10	67	87	100	56	<u>100</u>	100	83	100	100	100
	13,16,17	33	50	67	67	76	67	89	58	93	93*
Present (3rd Person Plural)	14,15	83	75	67	67	100	<u>83</u>	92	100	100	100
Infinitive	19	83	100	100	89	100	100	<u>100</u>	100	100	100
	18	50	62	100	89	67	67	83	50	80	80*
Wh Question	45,46	41	43	67	55	100	<u>67</u>	100	100	90	100
Participle	31,32	67	56	83	92	83	100	<u>83</u>	86	95	90
Passive	37	0	12	0	33	0	0	17	0	30	40

— = age level at which 90% scored correct in normative data
* = items on which 8-11 year children in normative data did not reach 90% correct criteria.

Another and important observation can be made from the table. For all syntactic categories except conjunctions (and excluded items 1-6), there is a period of linguistic growth followed by a period of decline and finally a second period of growth. Although there are exceptions, this second stage of linguistic growth generally exceeds SPLT criterion of 90%. Two exceptions are found with negatives (34) and future tense (11). The pattern in these categories tends toward early correct usage and then decline. Normative data were not available for item analysis; therefore it was not possible to determine how much of this observation can be attributed to normal linguistic development and/or linguistic interference.

Discussion

The purpose of this study was to compare and to identify the shorter-term differences in expressive syntax of children enrolled in a French-immersion program to the normative data compiled by Werner and Kresheck (1974) on English monolingual children. From the statistical analyses, no overall difference was found between the data on French-immersion subjects and the normative data. With this major finding, however, it is important to note that unique differences between the groups did exist, along with some noted trends.

The French-immersion and normative-data subjects initially scored similarly on the SPLT at the age range of 4-0 to 4-5 as shown in Table 2. The French-immersion subjects in this range are beginning the immersion program and their second language skills are not developed. At this point, they can be considered monolingual because of their minimal development of French language skills. This would account for the similarity in scores.

From the age range of 4-6 to 5-11, French-immersion scores were lower than those reported in the normative data. It is possible that some language interference as discussed by Lindholm and Padilla (1978) was causing this difference. Subjects at this age level were in JK and K and were learning and developing more extensive use of French. The program was concentrating on their use of French expressive syntax skills. Possibly, this was at the slight expense of the English skills. The differences, however, were within 2 standard deviations of the mean, which is considered within normal limits in the SPLT. Monolingual children obtaining these scores would not be considered language delayed until their scores were more than 2 standard deviations lower than the mean (Werner & Kresheck, 1974).

At the ages of 6-0 and above, the French-immersion subjects were performing as well as or better than the subjects reported in the normative data; an observation made by Maynard (1980). This occurred even before English-language arts instruction commenced during the second grade. This finding supports the notion that the subjects have developed linguistic coping strategies as outlined by Ben-Zeev (1977), which enable them to reduce and/or eliminate linguistic interference that may occur with respect to second language learning.

The subjects' performance in this study was also similar to those of French-immersion students in the PSBGM. In these schools, English language development skills of French-immersion children were comparable to their monolingual peers at the end of grade 3 (Genesee, 1979); the French-immersion subjects in this study compared similarly to their English monolingual peers by grade 1. Results of this study were also consistent with the findings of Swain (1978). In Swain's study, as in this one, bilinguals performed similarly to monolinguals on certain aspects of English at one grade level and outperformed them at a later grade. In reference to the normative data of Werner and Kresheck (1974), better performance was found for the 7-year-old (generally second graders) bilinguals than for the normative subjects. This difference disappeared by the third grade, where subjects were functioning at a criterion level of at least 90%. In Swain's study, these performance characteristics were seen in grades 4 and 5, respectively.

Item Analysis

Carrow (1972) reported that bilinguals show difficulty with receptive understanding of the syntactic areas of nouns, pronouns, plurality of nouns, and noun phrases with two adjective modifiers. Nez Percé subjects (Ramstad & Potter, 1974) demonstrated linguistic inadequacy in the areas of prepositions, possessives, verb tense, and possessive pronouns. Subjects in this study did not demonstrate problems with these syntactic errors in expression with the exception of one form of verb tense, the third person singular present tense.

Subjects in this study had not mastered the imperative category until age 7-0. However, in escorting and introducing the subjects to the testing area and the study, the examiner observed the correct use of the imperative tense in the spontaneous speech of many children in JK. It is felt that the discrepancy was due to failure of the test instrument to adequately measure this specific expressive syntactic category. The stimulus (photograph) was of poor quality — the photograph was dark and the items to be observed were not readily discernible. The verbal eliciting statement did not yield the desired response. Prompting was required in many cases before the subjects gave the correct response.

The passive tense showed the lowest overall mean percent correct for the French-immersion subjects. Although this construction was not observed in spontaneous speech by the examiner, it is felt that the scores were low because the use of passive voice is nonobligatory in adult language. The stimulus was a picture of a car involved in a motor vehicle accident. The eliciting statement was long and involved. Most subjects gave an appropriate response, but failed to use the passive tense, instead using active tense even after prompting. The photographs and eliciting statements for the two categories, imperative and passive, were the only items in the test instrument judged by the examiner to be inappropriate for eliciting the desired response.

Clinical Implications

Miller (1978) discusses issues relative to the bilingual. His concerns are consistent with the present study. At least three areas are worth delineating as a consequence of the results reported herein.

First, the age-maturity factor should be considered. It is well known that language and communicative skills mature with age. With the bilingual, it is more than difficult to separate linguistic interference, immaturity, and variables unrelated to language and communicative development. Any assessments made by the professional should, initially, be guarded because of these variables.

The second factor, not unrelated to age-maturity, is length of time in the French-immersion program. Since this study, like others, found no lasting differences, speech-language pathologists' expectations of performance should be guided by existing and available norms. For example, the French-immersion subjects lagged behind the normative data up to the age of 6-0, at which time scores were similar to or better than the normative data. A child from a French-immersion program thought to have a language delay should be reassessed around the age of 6-0. At this point, the delay should have disappeared.

The third factor is the type of syntactic error. If the child is making errors similar to the ones made by the subjects in this study, there may be less cause for concern about a perceived language delay. However, if the child is making errors on items expected to be mastered at an age more than two years below the chronological age, there is need for concern. For example, a child aged 6-6 who has not yet mastered the prepositions and plural nouns as measured by the SPLT would likely benefit from language therapy. On the other hand, if a child of the same age fails to master forming the Y/N interrogatives, for example, it is likely that the item would be mastered at a later age without benefit of therapy.

Children in a French-immersion program suspected of having a language delay should be closely monitored to determine progress in all areas of language acquisition. Speech-language pathologists in the schools generally have large caseloads and may need to accept clients on a priority basis. In this case, priorities can not be based solely upon severity and/or deviancy. As Miller (1978) indicates, one must consider the child's total environment in order to understand the unique needs before developing the therapeutic plans, if any.

Conclusions

The results of this study support the hypothesis that there were no lasting differences in the English expressive syntactic skills of French-immersion subjects relative to the English monolingual subjects who made up the normative data. In

fact, the slightly higher scores, starting at age 7-0, may indicate that these subjects develop expressive syntactic skills at a faster rate than monolinguals. It should be noted that when compared with English monolinguals, the French-immersion subjects, starting at age 7-0 and above, made the same number of errors or fewer. An item analysis revealed that although the same number of errors were being made, the errors occurred in different syntactic categories. The French-immersion subjects revealed scores at least two years lower than the norms in the specific syntactic categories of imperatives, reflexive pronouns, present tense verbs (third person singular), negatives, Y/N interrogatives, and passive tense.

Performance of expressive syntax was similar to the results of tests of English language development administered to children in similar programs.

The success of this study can be seen in the consistency of trends with related studies. Obtained variances can be attributed to the specific area investigated, that is, expressive syntax. On the other hand, some variation, not necessarily adverse, can be attributed to the small sample size; this may have affected the reliability (in this case, accuracy) of specific scores. The SES of the subjects and the SPLT, which measured a different aspect of syntax, can account for some of the differences with other studies.

It would have been more than helpful to have collected normative data on English monolinguals in the population for comparison with these French-immersion subjects. This problem is a major one and not unique to the present investigation.

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DAVID W. HEMBLING

School District #24 Kamloops

and

BOB GILLILAND

Centre for Stress Management

Is There an Identifiable Stress Cycle in the School Year?

From a random survey of 230 personnel in various role-groups of a large British Columbia school district, it is suggested that an identifiable stress cycle occurs with agreed pattern and regularity and is measurable and statistically significant. A meaningfully different stress cycle, over the school year, was identified by elementary as compared to secondary teachers. A broad review of the stress literature, beginning with Selye, is included.

In recent years major attention has been turned to the phenomenon of human stress, not only in medicine and psychology, but in virtually every one of the health science professions. In Spring 1980, the British Columbia Teachers Federation undertook a province-wide survey of teachers' opinions with a goal to forming a list of identified or perceived "stressors" in their work environment at the schools.¹ The study being reported here does not attempt to identify specific stressors, or causes of stress per se. Rather, we were concerned with the possible presence of a *stress cycle*, or rhythm from month to month during the school year, as it may be perceived by various professional and clerical personnel within a large school district. Viewing the school district as a system, we tested the hypothesis that there exists a regular and synchronous stress cycle within the ten-month school year, and that it is possible to identify and measure the cycle or cycles by having personnel within the system rate their own perception of stress from the perspective of their various role groupings. If there is such an identifiable stress

Dave Hembling completed his Master's degree and a one-year clinical internship in 1969. He has had a wide clinical experience, from staffing a rural counselling center in Alberta to directing a large treatment center for emotionally disturbed children in British Columbia, and is currently a Consulting Psychologist with the school district at Kamloops, B.C.

Bob Gilliland (Master's in Social Work, 1967) has had broad clinical experience both in university teaching and supervision, as well as in mental hospitals and prisons. Bob is currently Director of the Stress Management Centre in Kamloops.

cycle in the system, based on the simple variable *time of year*, there may be worthwhile adjustments for the system by such simple maneuvers as elective special event timetabling changes.

The findings of the survey appear to indicate that, at least within the studied school district, there is an identifiable stress cycle, with an agreed pattern and regularity which is measurable and statistically significant. The perceptions of personnel in several different roles congrue strongly on within-group percepts with respect to the cycle's periodicity and amplitude, while they show between-group differences in perceived stress level, though not on periodicity. A striking difference appears between elementary and secondary teachers.

Literature Review

The original work by Hans Selye (1976) which centered on physiological responses to stress was pioneered in the early 1930's and has developed into his thesis that the body has a General Adaptation Syndrome (GAS) which can be triggered by a wide range of environmental and mental stimuli: bacteria, noise, temperature, worry, conflict, excessive demands. Once the "alarm system" is initiated in the body, a fairly predictable biochemical sequence of events occurs. This may be summarized in Cannon's fight/flight theory in which the body is mobilized for emergency situations, Selye's Stage One. However, the body's ability to tolerate arousal is limited. With prolonged activation, the body enters into Selye's Stage Two, that of adaption or resistance, in which the body continues to adapt to the demands placed upon it. At this stage, the person usually feels alert, mobilized, and symptom-free. If continued adaption is required, the body finally enters into Stage Three, that of collapse during which the body becomes depleted and exhausted. At this point, we become susceptible to disease, illness, and other forms of dysfunction.

Lazarus (1966), in developing his model of stress focussed not on the physiological process, but rather on the person and his reaction or response to a stressor, that is, the transaction between an individual and a stress event. This response is mediated by an appraisal network which consists essentially of cognitive and affective memory scanning. Based upon the degree of threat perceived, the individual then reacts holistically: that is, physiologically, psychologically, and behaviourally.

Further work on the concept of stress has been pioneered by Holmes and Rahe (1967), in which they relate health changes to the history of recent significant changes in one's life system (divorce, being fired at work, outstanding personal achievement). The more *changes* one experiences within a limited time frame, the less adaptive energy one has to handle stressors; consequently, there is an increased susceptibility to dysfunctioning, whether physical, psychological, or a combination of the two. At this point in the development of stress research, it is still not possible to predict which individuals will become ill or dysfunctional because of stress overload. However, the degree of life change has been related to such things as cardiac disease, minor illness, fractures, athletic and traffic injuries, depression and alcoholism (Petrich & Holmes, 1977). The current work of Kobasa (1979) suggests there may be a hardiness factor to help explain why some people become ill and others do not, even though both are facing a similarly high degree of stress. The work of Friedman & Rosenman (1974), in identifying Type A and Type B behaviour, suggests that those with a definite Type A Personality show a greater risk for cardiovascular disease.

The connection between psychosocial variables and health change is apparently very complex and multidimensional. Pelletier (1979), after analyzing the stress research, concludes that the effects of stress are dependent upon:

1. the degree of individual reactivity to a stressor,
2. the duration of reactivity over time,
3. the background of long-term physiological arousal,
4. whether the pituitary or adrenomedullary system is more activated by a stressor.

In summary, research indicates that susceptibility to a stress reaction is holistic and is a function of the frequency and amount of stressors, of the degree of perceived threat of a stress event, of coping skills, inherent biological reactivity, diet, exercise, stage of life, and of social support systems.

Research Method

A survey questionnaire was circulated through school principals to a random selection of whole schools, with a return rate averaging 70% quite uniformly across role groups. Information was anonymously collected in respect to 17 variables:

- 1: Identification of respondent's role group: Elementary classroom teacher; Secondary classroom teacher; Principal, Vice-principal or administrative assistant; Secretary in a school administration office; Janitors.
- 2-13: A Likert Scale of 5 categories by which each month of the calendar year could be rated: very little stress, 0; some stress, 1; fairly stressful, 2; quite stressful, 3; highly stressful, 4.
- 14: Years of education. Calculated with grade 12 counted as 12 and adding each completed year of university or postsecondary (e.g., secretarial) training. For example, grade 12 plus five-year BEd counted as 17 years education.
- 15: Number of years employed in the present occupational role group.
- 16: Age of respondent in years, as of the past birthday.
- 17: Male or female.

Kamloops School District

The Kamloops School District serves a population area of approximately 70,000 with 37 elementary and 10 secondary schools. The district employs 966 teachers (50 of which are principals, vice-principals, and administrative assistants) and approximately 100 school secretaries. The survey was randomized by the method of selecting 5 elementary and 2 secondary schools from the whole district and then asking the principal of the selected schools to have each staff member complete the questionnaire. Specific requests were made to be sure that *all* staff had an opportunity to respond, including nonteaching personnel. The remaining schools (40) were sent a different request, through their principals, asking to have only the administrators, secretaries, and janitors complete the survey. An attempt was made in this way to obtain a random sampling of school district administrators, teachers, secretaries, and janitors.

Initially, returns were obtained which differentiated principals from vice-principals and administrative assistants, but the 28 principals were pooled with the 16 vice-principals and administrative assistants as their individually calculated statistics on the five parameters of Likert Scale, years of education, years in role, age, and sex correlated highly (mean $r=0.96$).

ROLE GROUP	NUMBER	MALES	FEMALES
Elementary Teachers	90	33	57
Secondary Teachers	54	39	15
Principals, Vice-Principals and Administrative Assistants	44	40	4
School Secretaries	28	0	28
Janitors	14	11	3

Differential Perceptions of Annual Stress Cycle by Role Groups

The five role groups depicted in Table 1 show differences in their various education attributes as might have been expected. The most significant aspect of the various role groups' perceptions of the school year stress cycle is shown in Figure 1, where the Likert Scale ratings for each month are graphed. One of the most frequently asked questions by persons taking part in the survey was to know if the secondary and elementary teachers rated the year differently. Although the mean rating over the twelve-month period, comparing these two groups, is not statistically significant, the ratings for the months of August, October, December,

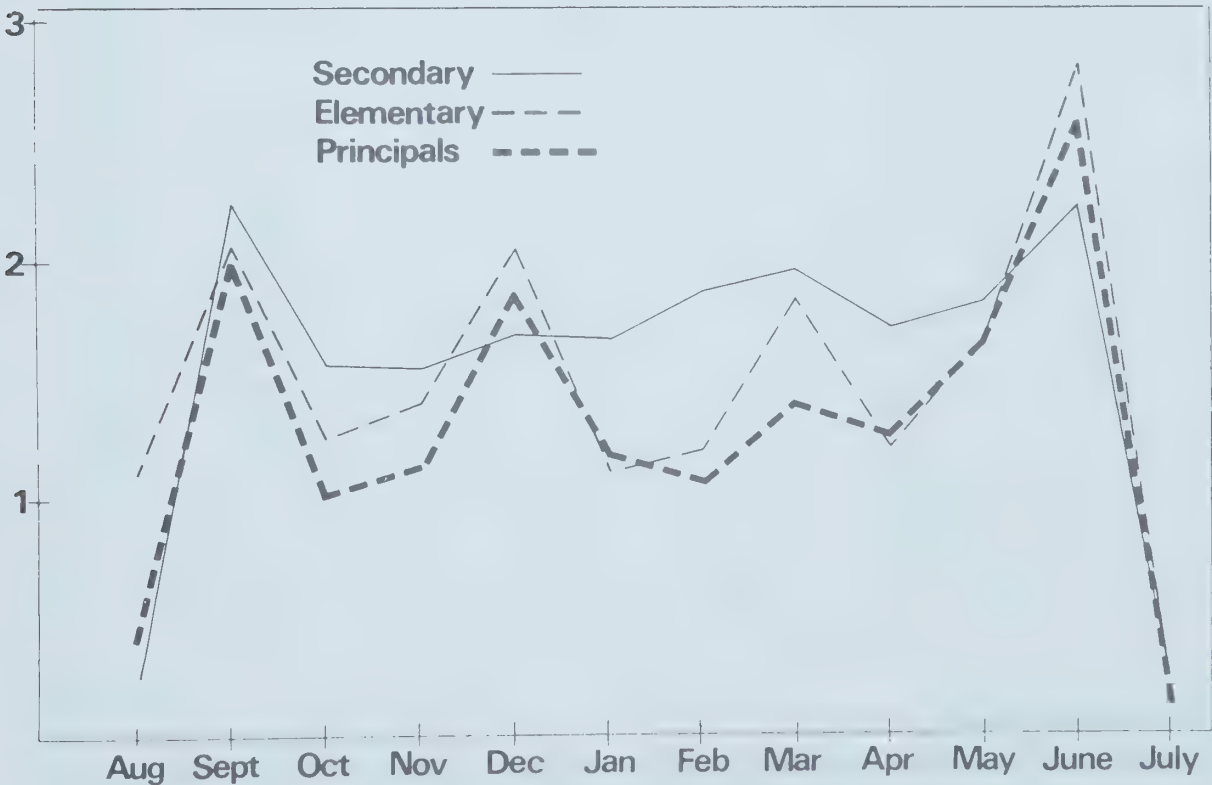


Figure 1. Mean monthly stress perceived by secondary and elementary teachers and principals in Kamloops.

January, February, April, and June showed varying significance levels, as shown in Table 3. The inordinately high rating which June received by all role groups (slightly less by secondary teachers) may be influenced somewhat by the fact that the survey was administered during the latter half of this same month.

It appears that although the three role groupings of secondary teachers, elementary teachers, and principals live and work in a commonly perceived *periodic* stress cycle, throughout the months of the school year, they differ greatly on the degree of stress variation from month to month. The elementary teachers appear to experience four strong peaks in stress during the year, while the secondary teachers experience two peaks, and with a less marked diminution between the two peaks.

The school janitors and custodians were included in the survey, but showed no pattern that was statistically capable of differentiation from randomness. Nevertheless, their grouped data are included in Tables 1 and 2.

TABLE 1
CHARACTERISTICS OF PERSONNEL IN FIVE ROLE GROUPS

Role Group	N		Years in Role	Years Education	12-month Total for Likert Scale
Secondary Teachers	54	36.796	8.352	17.352	18.685
		8.034	6.022	0.935	9.032
		1.093	0.820	0.127	1.229
Elementary Teachers	90	35.244	8.367	16.200	16.867
		6.895	5.948	1.704	7.810
		0.727	0.627	0.180	0.823
Principals, V-Principals & Admin. Assistants	44	42.295	10.227	17.659	15.545
		6.234	6.342	1.033	8.727
		0.940	0.956	0.156	1.316
School Secretaries	28	39.893	7.214	12.571	13.893
		9.418	3.695	0.997	10.282
		1.780	0.698	0.188	1.943
Custodians & Janitors	14	47.571	10.571	10.000	9.071
		9.921	5.761	1.468	6.592
		2.651	1.540	0.392	1.762

Note. Statistics are: Mean
S.D.
S.E.M.

Statistical evaluation of possible relationships between perceived stress level and all other reported variables failed to disclose anything meaningful, with one minor exception. A small inverse correlation between reported stress and age was found in the elementary teachers ($r=-0.29$).

TABLE 2
LIKERT SCALE RATINGS FOR EACH MONTH BY ROLE GROUPINGS

Role Group	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July
Elementary Teachers	1.122	2.067	1.256	1.411	2.056	1.100	1.211	1.833	1.211	1.656	2.811	0.133
	0.419	1.197	0.955	1.016	1.275	1.082	1.044	1.173	1.076	1.247	1.189	1.690
	0.044	0.126	0.101	0.107	0.134	0.114	0.110	0.124	0.113	0.131	0.125	0.073
Secondary Teachers	0.259	2.241	1.574	1.556	1.685	1.667	1.870	1.963	1.704	1.815	2.222	0.130
	0.732	1.148	1.191	1.093	1.163	1.082	1.182	1.258	1.268	1.333	1.269	0.616
	0.100	0.156	0.162	0.149	0.158	0.147	0.161	1.171	0.173	0.181	0.173	0.084
Principals, V-Principals, Admin. Assts.	0.409	2.000	1.023	1.136	1.864	1.182	1.068	1.386	1.227	1.636	2.545	0.068
	0.622	1.201	0.876	1.002	1.091	0.971	0.974	1.039	0.985	1.222	1.337	0.255
	0.094	0.181	0.132	0.151	0.164	0.146	0.147	0.157	0.149	0.184	0.202	0.038
School Secretaries	0.714	2.321	1.179	0.893	1.357	0.786	0.536	1.071	1.000	1.321	2.500	0.214
	1.272	1.307	1.219	1.031	1.224	1.031	0.962	1.215	1.186	1.188	1.291	0.568
	0.240	0.247	0.230	0.195	0.231	0.195	0.182	0.230	0.224	0.225	0.244	0.107
Custodians, Janitors	0.214	0.714	0.500	0.643	1.429	0.929	1.000	1.071	1.000	0.643	0.857	0.071
	0.802	0.825	0.519	0.633	1.222	1.207	1.109	0.829	1.038	1.082	1.292	0.267
	0.214	0.221	0.139	0.169	0.327	0.322	0.296	0.221	0.277	0.289	0.345	0.071

Note. Statistics are: Mean
S.D.
S.E.M.

TABLE 3
COMPARISON OF LIKERT SCALE RATINGS OF EACH MONTH
BETWEEN SECONDARY AND ELEMENTARY TEACHERS

Month	t ratio	Confidence Level
August	7.90	$p<.001$
September	0.87	not significant
October	1.67	$p<.05$
November	0.79	not significant
December	1.79	$p<.05$
January	3.05	$p<.002$
February	3.38	$p<.001$
March	0.62	not significant
April	2.39	$p<.01$
May	0.71	not significant
June	2.76	$p<.005$
July	0.03	not significant

Summary

Pelletier identified reactivity to a stressor over time as being significantly involved in stress symptoms. This suggests the possibility of *stress cycles* among certain professions, especially those that have variable work demands placed upon them. The survey of professional and clerical personnel in one school district

indicates that such a cycle is identifiable, and that this cycle is significantly different between elementary and secondary schools.

Should further research support the findings of this study, there are practical steps which might be taken to reduce the stress overload on teachers, for example, elective or special events might be timetabled to low points in the identified stress cycle.

Notes

1. Correspondence with Nora Grove, B.C.T.F., 105-2235 Burrard Street, Vancouver, B.C., V6J 3H9.

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BARRY F. SQUIRE

Armidale College of Advanced Education

W. GEORGE CATHCART

and

JOAN E. WORTH

The University of Alberta

Prospective Elementary Teachers' Proficiency in Grade Six Mathematics

This study was designed to discover the level of proficiency in grade six mathematics of students in a mathematics curriculum and instruction course, and to examine any relationships with instructional modes and with student attitudes toward and ranking of mathematics with other fields of study. A pretest and posttest were administered to the students, consisting of a mathematics inventory, an attitude measure, and a ranking scale. Results indicated: (1) a mean proficiency level of 60% on both pre- and postmathematics inventories, (2) no relationship between instructional mode and proficiency, (3) a significant correlation between attitude and proficiency, and (4) a strong relationship between ranking of mathematics and proficiency.

The young adults who enter teacher training programs come in with a wide range of abilities and attitudes. Assumptions made about threshold proficiency or mastery levels of these students are often found by instructors in the course of the program to be over-optimistic. Several studies have been concerned with this inadequate background knowledge in mathematics and have examined the effects

Barry Squire taught secondary school mathematics in Australia before joining the Armidale College of Education. Mr. Squire received his MEd from the University of Alberta in 1978, specializing in elementary mathematics education.

George Cathcart received his PhD in 1969 from The University of Alberta. His teaching experience includes four years with the Edmonton Public School Board and the last 12 years with the Department of Elementary Education at The University of Alberta as a Professor of mathematics education.

Joan Worth taught elementary school in Edmonton prior to receiving her PhD in mathematics education from the University of Minnesota. Joan has been on staff in the Department of Elementary Education at The University of Alberta since 1969.

of instructional modes on this knowledge in courses in mathematics and mathematics curriculum.

Reys (1968) investigated the understanding of contemporary mathematics by elementary education majors at the University of Missouri. Fifty-five percent of his sample scored below the median of year eight and nine pupils on a contemporary mathematics test. It might be expected that today's teacher trainees have a better understanding than Reys' study indicated, as they have been schooled in the "new" curriculum themselves. If not, then there is still a critical need for improving the mathematics preparation of elementary teachers. Other studies attempted to study the effect of a laboratory lecture approach in teacher-training courses. Fitzgerald (1968) concluded that students' mathematical competence was unchanged by their laboratory experience with manipulative materials selected to complement the concepts considered in lectures. Warkentin (1975) found that a laboratory approach in teacher-training courses had a positive effect on attitude and the lecture approach appeared to increase course achievement.

In an earlier paper, *Effect of Mode of Instruction on Prospective Elementary Teachers' Attitudes Towards Mathematics* (Squire, Cathcart & Worth, 1981), the writers outlined a summary of attitudes to mathematics of 269 prospective elementary teachers enrolled in a mathematics curriculum course at the University of Alberta. The same group of students were also surveyed for their knowledge of basic mathematical skill and items commonly found in grade six mathematics programs and texts.

The present report is about the same students' responses on a specially prepared inventory of mathematics items, and examines the relationships with the instructional modes employed in the curriculum course and with the students' attitude to and ranking of mathematics with other fields of study.

Method

Subjects

The subjects were 269 prospective elementary school teachers enrolled in a one-term introductory course, Education Curriculum and Instruction 216, at the University of Alberta. The course was designed to examine concepts, topics, and instructional procedures in the mathematics curriculum of grades K through six.

Instructional Groups

The course was presented by five instructors who each had one group of students for the whole term of 13 weeks. One group (L), with 174 students, received three 50-minute lectures each week. The other four (S), with 30, 22, 25, and 18 students, had one lecture, a laboratory session, and a seminar each week.

Instrument

A 25-item Elementary Mathematics Inventory (E.M.I.) was constructed embodying aspects of the grade six mathematics curriculum. Each item was of multiple choice construction and was scored on I.B.M. answer sheets for machine scoring.

The students' attitudes toward mathematics were measured (as reported in the earlier paper) using an 11-point Dutton self-appraisal scale (D) and a 20-item

Likert-type scale (M.A.S.). Finally students were asked to rank the four major high school subject areas according to each of four criteria: "the most enjoyed at school," "the most worthwhile to have studied," "will be the most enjoyable to teach," and "will be my most competent area in which to teach."

Procedure

A pretest and a posttest were administered to the subjects in their instructional groups in the first and last sessions in the term. The same set of questions (described above) was asked on both occasions.

Hypotheses

The purposes of the study gave rise to four major hypotheses.

Hypothesis 1. There is no significant difference between pre- and posttest scores on the E.M.I. for (a) each group, (b) groups 2-5 combined (S), and (c) the whole sample.

A univariate analysis with the test as a repeated measure was used to test the three parts of the hypothesis.

Hypothesis 2. There is no significant difference between large lecture group (L) and seminar groups (S) on the E.M.I. using pretest as a blocking variable.

A two-way analysis of variance was performed using treatment (L and S) as the experimental variable and pretest performance on E.M.I. as a blocking variable. Three groups were identified by taking cutting points at ± 0.50 standard deviations from the mean on the E.M.I. pretest. This procedure yielded samples of approximately equal numbers of subjects with high, medium and low E.M.I. pretest scores for each treatment.

Hypothesis 3. There is no significant correlation between mathematics attitude as measured by (i) M.A.S. and (ii) D and E.M.I. scores for (a) the whole sample, (b) each treatment (L and S).

Pearson-Product-Moment correlation coefficients were calculated between D., M.A.S., and E.M.I. scores for each part of this hypothesis.

Hypothesis 4. There is no significant relationship between scores on the mathematics inventory (E.M.I.) and the ranking of mathematics as (a) an enjoyable field of study, (b) a worthwhile field of study, (c) an enjoyable field in which to teach, and (d) a field in which the student feels competent to teach.

A cross-tabulation (4 x 3 matrix) and chi-square analysis was carried out for each of the four cases. The same cutting points were used as in the Hypothesis 2 analysis to identify high, medium, and low groups on E.M.I. scores.

Results

Pre- and Posttest Mastery Comparisons (Hypothesis 1)

The mean scores for each group on the pre- and posttest of E.M.I. with *F* ratios and probabilities are presented in Table 1. On the basis of the computed *F* ratios in Table 1, Hypothesis 1 is accepted in all three cases. As indicated there is no significant increase in performance on the E.M.I. over the term. The average pretest score was 15 correct out of 25 and the average posttest score was essentially the same, 60% level of mastery.

TABLE 1
ANALYSIS OF VARIANCE USING PRE-AND POSTTESTS
AS REPEATED MEASURES

Group	N	Pretest	Posttest	F	Probability of F
1	174	14.42	14.31	0.023	0.881
2	30	16.87	17.03	0.012	0.913
3	22	15.27	16.73	0.544	0.469
4	25	16.12	16.16	0.001	0.979
5	18	15.61	14.72	0.176	0.680
2-5	95	16.06	16.30	0.070	0.792
1-5	269	15.00	15.01	0.000	1.000

Treatment Comparisons (Hypothesis 2)

The posttest means and variances for the treatment groups at each pretest level are given in Table 2. The number in each Lecture pretest group was approximately 60 and in each seminar pretest group, it was approximately 30.

TABLE 2
POSTTEST MEANS AND VARIANCES ON E.M.I. FOR TREATMENT GROUPS

	Pretest Groups								
	Low			Medium			High		
	N	$\bar{X}$	S	N	$\bar{X}$	S	N	$\bar{X}$	S
Lecture	65	13.6	55	56	13.9	75	53	17.4	55
Seminar	33	13.6	57	26	14.1	78	36	19.7	30

A summary of the analysis of variance of E.M.I. scores due to treatment and pretest levels is presented in Table 3. As expected there was significant variance due to pretest groupings into low, medium, and high achievement levels, but no significant effect was indicated for treatment nor was there any significant interaction between treatment and pretest level. Hypothesis 2 was therefore accepted.

TABLE 3

SUMMARY OF ANALYSIS OF VARIANCE OF E.M.I. SCORES
USING PRETEST AS BLOCKING VARIANCE

Source of Variance	d.f.	Mean Square	F	Probability of F
Treatment (A)	1	68.6	1.17	0.279
Pretest Level (B)	2	643.5	11.02	< 0.001
A $\times$ B	2	30.8	0.53	0.591
Residual	263	58.4		

Relationship Between Mastery and Attitude (Hypothesis 3)

The correlation coefficients among posttest scores for the whole sample and for treatment groups are shown in Tables 4 and 5. For the whole group of 269 students, there is a very significant correlation between the M.A.S. attitude measure and the E.M.I. mastery score ($p < 0.001$). For the treatment groups, there is significant correlation again between M.A.S. and E.M.I. scores at the 0.01 level for lecture treatment, and at the 0.001 level for seminar treatment.

Even though there was significant correlation ($p < 0.001$) between the two attitude measures (M.A.S. and D), no significant correlation is indicated between D and E.M.I. scores. Hypothesis 3 is thus accepted in relation to the Dutton 11-point scale attitude measure, but rejected in relation to Aiken's 20-item attitude scale.

TABLE 4

CORRELATION AMONG POSTTEST SCORES FOR THE WHOLE GROUP

	D	M.A.S.	E.M.I.
D	1.000	0.597*	0.117
M.A.S.	0.597*	1.000	0.292*
E.M.I.	0.117	0.292*	1.000

* $p < 0.001$

Relationship Between Mastery and Ranking of Mathematics (Hypothesis 4)

The nonparametric analysis employed to test Hypothesis 4 produced two-dimensional tables of frequencies of the four possible rankings available to the students versus proficiency categories on the E.M.I. pretest. A summary of the four tables so generated is given in Table 6.

TABLE 5
CORRELATION AMONG POSTTEST SCORES FOR THE TREATMENT GROUP

	D		M.A.S.		E.M.I.	
	L	S	L	S	L	S
D	1.000	1.000	0.531**	0.683**	0.167	0.135
M.A.S.	0.531	0.683**	1.000	1.000	0.272*	0.387**
E.M.I.	0.167	0.135	0.272*	0.387**	1.000	1.000

* $p < 0.01$ ** $p < 0.001$

A strong relationship can be seen between mastery level and ranking of mathematics. There was a general trend for students with a higher mastery (E.M.I.) score to rank mathematics higher on each of the four criteria. The number of students who completed the ranking exercise was only 183 (out of 269). This depletion resulted from 68 out of 98 of the *low* E.M.I. group filing a null or void return on this part of the survey. It could be inferred that if valid returns had been submitted by this group, an even stronger negative ranking would have been evident in the L column in Table 6.

The relationship is established statistically by the chi-squares in all cases being highly significant ($p < 0.001$). Hypothesis 4 was therefore rejected for all four ranking criteria.

TABLE 6
FREQUENCY TABLES FOR RANKING OF MATHEMATICS
BY STUDENTS GROUPED ACCORDING TO PROFICIENCY

Ranking criterion	Rank	EMI Pretest Groups			Totals		χ^2
		L N=30	M N=68	H N=85	N (183)	%	
(a) Enjoyable to study	1	7	16	38	61	33.3	129.6*
	2	7	14	20	41	22.4	
	3	6	19	14	39	21.3	
	4	10	19	13	42	22.9	
(b) Worthwhile to study	1	6	17	28	51	27.9	129.3*
	2	11	22	35	68	37.2	
	3	11	21	13	45	24.6	
	4	2	8	9	19	10.4	
(c) Enjoyable to teach	1	4	18	38	60	32.8	144.7*
	2	13	18	34	65	35.5	
	3	8	26	9	43	23.5	
	4	5	6	4	15	8.2	
(d) Feel competent to teach	1	3	14	35	52	28.4	139.5*
	2	13	24	34	71	38.8	
	3	12	24	13	49	26.8	
	4	2	6	3	11	6.0	

* probability < 0.001

Conclusions

The survey indicated a number of significant findings, some of which have implications for the teacher educator. The mean proficiency level of 60% on a test of grade 6 mathematics seems hardly adequate for a beginning teacher. Since the study indicated no increase in proficiency occurring as a result of the curriculum course, perhaps a special compulsory course needs to be offered for students with less than, say, 80% proficiency in elementary school mathematics. Such courses in skills and content have been piloted recently in several Australian Colleges of Advanced Education with apparent success. Squire (1979) reports an overall mean gain of 19.8% in proficiency of 184 preservice trainee elementary teachers who undertook such a skills program of 1 hour per week for a semester. An overall posttest mean of 83% was encouraging, although certain areas of skills such as statistics and number properties still presented difficulty to 50% of students.

In the present study the absence of increase in proficiency should not be interpreted as a weakness in the curriculum course undertaken by students. It was not specifically intended to upgrade skills in grade 6 mathematics, but one might have expected such a "spin off" from the examination of instructional procedures involving these same skills and concepts. It appears that such an expectation is not justified.

Contrary to several other studies (Todd, 1966; Warkentin, 1975; and Cathcart, 1975) this survey indicated that mode of instruction made no difference to level of proficiency. The test scores remained very much the same irrespective of whether students were instructed by three lectures a week or by a lecture-seminar-laboratory technique. This is not to say that various instructional techniques are not beneficial, for many studies have found positive attitude correlation with activity-laboratory methods (Cathcart, 1975; Fuson, 1975; Wall, 1973; and Warkentin, 1975) when used with prospective teachers.

A significant correlation between attitude and proficiency was shown in the present study, at least when the attitude measure was that given by the Aiken 20-item, 5-point scale. This is interesting to note, even though Suydam and Weaver (1975) comment that there is no consistent body of research evidence to support an attitude-achievement correlation in school pupils in relation to mathematics. Aiken's (1972) claim of reliability and validity for his scale when used with postsecondary students gives added weight to the present finding of attitude-proficiency correlation.

The strong relationship between proficiency level and ranking by students of mathematics on all four criteria is further support for a link between attitude and proficiency. The four criteria all express an attitude towards mathematics either of enjoyment, value, or feeling of comfort. It would seem important therefore to attempt to develop positive attitudes towards mathematics along the lines indicated by the ranking criteria if prospective elementary teachers are to develop mathematical proficiency also. This is not a new idea for mathematics educators but it is one that needs to be constantly activated.

Two final comments on the study concern controlling instructor personality factor and testing a wider range of skills. If the staffing and timetabling situation enabled it to be done, the large lecture group and at least one of the smaller seminar-lab groups could have the same instructor. While the course presented by all five instructors was team planned and as uniform in content as possible, it is

readily admitted that some instructor bias could well have influenced results. A measure of control over this would be desirable, if not essential.

Finally, the E.M.I. items spanned only five topic areas: numeration, rational numbers, spatial concepts, measurement, problem solving. Pirie (1979) advocates a list of 18 topics of skills and knowledge which must be mastered by a person who is to be classified as functionally numerate. A beginning teacher should be such a person, and a useful framework upon which to plan a program for preservice students might be the list of basic skills suggested by the National Council of Supervisors of Mathematics (1977). These would seem to embody Pirie's suggestions which were based on the summary of the N.A.E.P. Mathematics Assessment by Carpenter, Coburn, Reys and Wilson (1975).

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LARRY R. COCHRAN

The University of British Columbia

A Method for Monitoring Learning Activities and Experiences in Studying Prose

This study is an investigation into the reliability, predictive validity, and potential usefulness of a method for monitoring unobservable events while a person is studying. Sixty-six university students studied a chapter, rated the way they studied each of 10 sections of the chapter on 10 study variables, and completed two tests on the chapter. Subjects were also divided into five groups. Three groups were exposed to different types of adjunct questions and one group used a method for organizing comparative information. The final group was a control group. Findings indicated that self-ratings were reliable, predictive of learning, and sensitive to treatment condition.

The general purpose of this study is to explore the reliability, sensitivity and validity of one method of monitoring unobservable events during study. If successful, the development of monitors could prove useful in specifying how treatment conditions gain their effects, in resolving inconsistencies in results, and in explaining failures to replicate. Monitors could also be useful in training programs where it is important to determine how reliably or accurately a person is executing a particular strategy of learning.

As a concrete example, consider adjunct questioning (Rothkopf, 1966). In one variation, factual questions are inserted in text after the material to which they refer. Without looking back, subjects answer these questions and then continue reading. When subjects read the next section, they tend to learn more. Factual postquestions increase learning in subsequent sections. However, there have been marginal results (and consequently, failures in replication) and inconsistent results (e.g., Marton, 1976; Moeser, 1978). How can these difficulties be satisfactorily resolved?

Larry R. Cochran (PhD, University of Utah) is currently Assistant Professor at the Faculty of Education, University of British Columbia. He has worked in University Counselling Centres at Memorial University and the University of Victoria. His major research interest deals with implicit theories of learning, personality, careers, and the like.

It is doubtful that refinements in treatment conditions and outcome measures alone could resolve these difficulties. Indeed, since this paradigm of research directs attention to treatment conditions and outcomes, to the neglect of the complex experience in between, it could hinder resolutions. That is, after receiving factual postquestions, what exactly are people supposed to do that improves learning? How people react to factual postquestions is, at best, inferential as long as researchers attend only to treatment conditions and outcome measures.

When exposed to factual postquestions, some subjects might give up in frustration, others might become emotional or unsettled, and others might ignore the questions, going through the motions just to finish the experiment. To combat emotionality, some people might psychologically withdraw, downplay the importance of the task, or decrease effort. Others might rise to the challenge and increase effort, try to anticipate questions, or highlight facts rather than concepts, and so on. Although the treatment intervention looks simple enough, it is a very complex event in the ways it could influence people. For this reason, there is unlikely to be just one answer to why factual postquestions facilitate learning.

In a recent review, Anderson and Biddle (1975) conclude that we do not need more demonstrations of effectiveness, but demonstrations of why factual postquestions work. Yet, given the potential complexity of subjects' experiences and the prevalent method of research, it is difficult to imagine a happy outcome for this project. Unless researchers can develop ways to observe (using this term loosely) learning processes rather than depending solely on inference, what seems more likely is that adjunct questioning will generate a flood of research and gradually fade into neglect (a well-trodden path in psychological research).

What seems to be needed is a method that would allow a researcher to specify exactly what is supposed to happen in the way people study and to determine if it happened. In this way, a researcher could test various explanations of effectiveness, show why one experiment failed to replicate another, and perhaps begin to chart the various ramifications of the test-like event. The general role of a monitor, then, is to provide a way to "get closer" to the learning processes or activities involved in altering learning products.

There are two major problems that a method of monitoring must solve. First, learning activities (e.g., cognitive operations), effort, and emotion are not observable or, at least, not observable enough. To make the implicit explicit, one might use various forms of note-taking such as directed graphs (Pask, 1976), conversational methodologies (Thomas & Harri-Augstain, 1975), and probes (Britton, Piha, Davis, & Wehausen, 1978), among other things. In the present study, activities and experiences were monitored by self-report. The primary limiting factor is that a person can only report what he or she is capable of being aware of.

Second, monitors should either not disrupt or minimally disrupt the learning experience. In this experiment, the experience was not disrupted at all, as subjects relied on cued memory to report their experiences. Suppose the task were to read a chapter composed of ten sections. If a person made a self-report on supplied dimensions after each section, it could bias the experience. (Again, it might not. This has to be tested). This procedure is certainly close to the experience, but also is conceivably an influence on that experience. To remove the possibility of bias, subjects could read all sections. Then, afterward, by using each section as a cue, subjects could make a self-report upon what happened. This procedure is less

close to the experience, but incapable of influencing it. Its feasibility depends upon the accuracy of a person's cued memory for events that took place shortly before.

In the present experiment, college students studied ten sections of a chapter, rated those sections on ten study variables, and then completed two tests covering the chapter. The key questions involved at this point are: Are the self-report scales reliable? Are the self-report measures predictive of learning?

There are also five different groups: a control group, a conceptual prequestion group, a conceptual postquestion group, a factual postquestion group, and a group that was shown a method for organizing comparative information. These treatment conditions were included not so much to show differences in learning products, but to explore differences in processes. In short, are the self-report variables sensitive to treatment conditions? The key questions here are: Does treatment differentially affect the degree of learning activities? Does treatment affect the way in which these activities are related? Does treatment affect the strength of relations among activities? Does treatment affect the predictive validity of study variables?

Method

Subjects

Sixty-six students at the University of Victoria were recruited by poster. They were randomly assigned to the five treatment conditions, resulting in 14 subjects in the organizer group and 13 subjects in each of the other groups. The experiment lasted from 2-1/2 to 3 hours, for which each person was paid \$9.00.

Materials

Textbook chapter. The first chapter of Aubrey Manning's (1979) *An Introduction to Animal Behaviour* was used as the material to be learned. The chapter was divided into 10 sections, which ranged from about 340 words to 590 words in length. In total, the chapter is approximately 4600 words long. The chapter was altered slightly in two ways. First, all diagrams and pictures were deleted and the prose altered accordingly. Second, to lengthen the introduction, paragraphs from the conclusion were extracted and placed in the first section.

In this introductory chapter, Manning compared reflexes and complex behaviour on six properties: latency, after-discharge, summation, warm-up, fatigue, and inhibition. While the chapter is straightforward, it is also filled with details, examples, and new terms that could sidetrack injudicious readers and overwhelm others.

Self-report scales. The 10 bipolar study dimensions were:

1. studied topic just as a required reading/studied topic more because it became interesting,
2. tried to grasp the central point, referring back and forth to make ideas fit into a whole/took information as it came and tried to remember it,
3. felt focused, attuned to the discussion/felt scattered, had difficulty following discussion,
4. accepted statements without questioning them/questioned validity and generality of statements,
5. became emotional (distracted by irritation, frustration, pressure, and so on)/stayed calm and in control,

6. looked for principles or causes behind examples and details of behaviour/noted causes or principles, if presented, but did not search,
7. formed mental pictures from information provided/did not form mental pictures,
8. studied ideas in themselves without application to anything/thought about usefulness or significance of ideas,
9. studied more leisurely/studied more intensely, and
10. my understanding was due to my own efforts, what I made to happen/my understanding was due to the author's presentation, level of vocabulary, mood, and other factors beyond my control.

In this order, the study dimensions were aligned on a rating sheet, with five dots separating the poles of each dimension. The dots were labelled: definitely, to some extent, neither or in between, to some extent, and definitely. Subjects received 10 rating sheets, one for each section. They began with section one, skimmed the contents to cue their memory, and then, circled the dot for each dimension which best described how they studied that section.

Organization Test. After reading the chapter and rating each section on aspects of studying, subjects completed a test of organization and then a test of recall. In the organization test, subjects were given an envelope containing small slips of paper, numbered from 1 to 33. On each slip of paper was written an idea from the chapter. Ten slips contained the names of different properties of reflexes and behaviour: latency, fatigue, inhibition, motor recruitment, antagonistic induction, after-discharge, summation, warm-up, response specific, and stimulus specific. The latter two designate types of fatigue. Fourteen slips contained examples of these properties such as: frog's leg-wiping reflex, waning of chaffinch mobbing response, courtship of male *Drosophila*, mating of Praying Mantis, and the like. Nine slips contained more abstract phrases concerned with causal mechanisms and the nature of properties. For example, resistance to transmission in internuncial neurons designates a cause of fatigue, while integration of stimuli is a defining characteristic of summation.

Subjects were told to think of an order in which to present these 33 items to someone else who knew nothing about the chapter. This ordering was accomplished in three steps. First, subjects divided items into groups that seemed to go together. Second, they ordered the groups in the way they would present them to someone else. Third, they ordered the items in each group. A discard pile was allowed for items they could not place. When completed, they recorded the ordering on an answer sheet with a column of numbers from 1 to 33.

Recall test. The recall test was made up of 28 questions. Eleven questions asked for a definition of major terms; for example, what is reflex rebound, inhibition is _____, and the like. Ten questions required subjects to fill in the blank with the correct detail, cause, or explanation; for example, after-discharge can be lengthened and strengthened by _____? Last, seven questions asked for detailed knowledge of examples; for example, when presented with an owl, what do chaffinch do? What are the three steps in the reaction of a newly-hatched cuttle-fish to a tiny shrimp?

Treatment Conditions

Control group. This group simply studied the chapter.

Conceptual prequestion group. Before sections 3, 5, 6, 8, and 9, questions were inserted on a separate page. In writing at the top of the page, they were instructed

to use the following question as a study guide for the next section. The questions included the following: Compare aspects of latency in reflexes and complex behaviour. In what way or ways is summation in reflexes similar to summation in complex behaviour? Are these differences or potential differences? Is warm-up in reflexes the same as warm-up in complex behaviour? Or is there a difference? Contrast stimulus-specific fatigue and response-specific fatigue. Explain how the notion of inhibition in simple reflexes is extended to complex behaviour.

Conceptual postquestion group. After sections 3, 5, 6, 8 and 9, the same questions were inserted. Written instructions on the inserted pages stated that they were not to look back nor take more than a minute to answer the question. To reinforce this instruction, they were informed in underlined type not to write out a full answer, but to list a few of the points they would cover if they had to write a full essay. They could return to any section after they had read the chapter all the way through.

Factual postquestion group. After sections 3, 5, 6, 8, and 9, a series of detailed factual questions were inserted on separate pages. Subjects were instructed not to look back (until they had read the entire chapter) and to simply fill in the blanks. There were about four to five blanks to fill in for each section. The questions were factual rather than conceptual, involving memory for detail rather than organization of information. For example, two of the sentences for Section 3 were the following: When a tiny shrimp is presented to a newly-hatched cuttle-fish, there is no response for as long as _____. The latency of reflexes is known to be due to delay in the transmission of _____ across _____.

Methodological organizer group. This group did not receive questions, but were provided with a framework for taking notes. Subjects were informed that the chapter used six properties of reflexes to show how reflexes and behaviour were similar. To make their task easier, presumably, they were presented with a scheme for organizing ideas in a comparative essay. First, there must be bases for comparison (e.g., the six properties). Second, there will be information about the subjects of comparison. Third, there is a result for the comparison, a judgment of the extent to which two or more things are similar or different. Fourth, there must be some sense of significance in the judgment, which can be derived from the author's purpose. These four points were briefly explained and illustrated. Subjects were then provided with a sheet of paper with five columns. Above the columns were written the organizers: bases for comparison, information about reflexes, information about behaviour, result of comparison, and significance of comparison. Subjects were told that they could use this sheet to take notes or to just organize their thoughts as they read.

Procedure.

Students were tested in groups ranging from 7 to 20. The organizer group was tested separately, as they received unique instructions. The remaining groups were tested together. They were informed of the purpose of the study (i.e., to study how people learn from textbooks) and oriented to the tasks they would have to complete.

The chapter was handed out and subjects were informed that some would have questions inserted. They were instructed just to follow the direction and that if they ran across questions, they were intended as study aids. Students were then given 35 minutes to learn the chapter. Immediately after studying the chapter,

they rated each section on the 10 study dimensions and then completed the organization test. After a break, they completed the recall test.

Measures

Study dimensions. The circled dots or ratings were transformed into numbers, ranging from five to one.

Organization test. Organization scores ranged from 0 to 33. An item was counted if it was part of a well-formed group. A well-formed group was composed of a superordinate concept (e.g., latency, after-discharge, etc.) and subordinate examples, causes, and characteristics. Occasionally judgment was required, but, typically, students simply divided the items into six groups corresponding to the six major properties of reflexes. Consequently, in the future, it would be advisable to simply provide the superordinates in order to avoid having to make any judgments. However, in the present study, it was thought desirable to give students complete freedom in forming groups. If an item was correctly categorized, it was counted; if it was incorrectly categorized, it was not counted.

The intent of this measure is to assess the extent to which students could organize information. Students often seem to study in a way that isolates information and requires only memorization. While memory is involved in this test, it also requires knowledge of the way information was structured.

Recall test. Recall scores could vary from 1 to 28. If they answered a question correctly, it was counted. If they did not, it was not counted. Occasionally, judgments had to be made on these answers as well.

Results

The first question is: Are the self-report measures reliable? For each dimension, there were 10 ratings (one for each section). For each subject, the odd and even ratings were summed separately. A Spearman-Brown reliability coefficient ($2r/1 + r$) was calculated for each group. As can be seen from Table 1, these reliabilities tended to be high.

TABLE 1
ODD-EVEN RELIABILITIES OF STUDY VARIABLES FOR EACH GROUP

Group	Study Variables									
	1	2	3	4	5	6	7	8	9	10
Factual Postquestion	.75	.86	.61	.93	.91	.91	.94	.63	.77	.85
Conceptual Prequestion	.91	.97	.90	.97	.96	.97	.91	.91	.78	.98
Control	.77	.87	.79	.96	.93	.93	.76	.70	.48	.57
Conceptual Postquestion	.91	.93	.94	.85	.99	.90	.90	.94	.95	.90
Organizer	.94	.86	.89	.96	.89	.90	.90	.92	.90	.91

It might be noted that the reliabilities were not high due to any uniformity in ratings. Some subjects tended to rate each section in more or less the same way on some or most dimensions. However, most students showed medium to considerable variability.

The second question is: Do these dimensions have predictive validity? As can be seen from Table 2, there were many significant correlations with organization scores and some with recall scores. With increased *N*, many more would have reached significance, as suggested by the overall correlations. Second, the correlations indicate variability across groups. Some treatment conditions seemed to highlight the importance of one variable for learning while other conditions highlighted another variable. For example, the factual postquestion group shows a strong, counter-intuitive correlation between imagery and organization scores. The more students used mental images, the worse they did. The less they used mental imagery, the better they did. One plausible explanation is that imagery which facilitates learning is interactive, combining diverse aspects into a unifying picture.

TABLE 2
CORRELATIONS OF STUDY VARIABLES WITH ORGANIZATION
AND RECALL SCORES BY GROUP

Group	Study Variables									
	1	2	3	4	5	6	7	8	9	10
Organization Scores										
Factual Postquestion	.11	.33	-.24	.18	-.16	.26	-.80**	.10	.30	.11
Conceptual Prequestion	-.19	.52*	.18	-.59*	.02	.09	.42	-.04	-.67**	.55*
Control	-.38	.49*	.66**	-.48*	-.62*	.12	.45	-.49*	.32	-.09
Conceptual Postquestion	-.46	.39	.51*	-.31	-.21	.34	.29	-.24	-.55*	.17
Organizer	-.19	.51*	.55*	.19	-.39	-.01	.08	-.23	-.18	.31
All Combined	-.22*	.44**	.28**	-.16	-.19	.16	.10	-.18	-.21*	.27*
Recall Scores										
Factual Postquestion	-.13	.01	-.16	.36	-.01	.03	-.36	.26	.11	-.05
Conceptual Prequestion	-.25	.32	.45	-.67**	-.15	.23	.15	-.26	-.26	.57*
Control	-.35	.56*	.45	-.42	-.52*	.32	.33	-.38	.19	-.10
Conceptual Postquestion	-.18	.16	.15	-.19	-.47	.15	-.25	-.30	-.05	.11
Organizer	-.30	.39	.30	.06	-.34	.00	.41	-.44	-.19	-.14
All Combined	-.24*	.31**	.23*	-.19	-.25*	.17	.08	-.27*	-.09	.12

* *p*<.05
** *p*<.01

Perhaps, the factual questions disposed students to memorize in an isolated rather than an integrative fashion, as they would have been encouraged to read for detail rather than structure. Correct or not, the strength of this correlation and its strong divergence from the same correlations for the control and prequestion

groups requires explanation. Perhaps the most fruitful view of these correlations is that treatment condition appears to affect the predictive validity of study dimensions. A third aspect of Table 1 is that the decreasing strength of correlations across groups suggests that treatment condition might disrupt or weaken the validities of dimensions. The control group had the strongest correlations and the factual group the weakest. It appears that the more intrusive an intervention is, the less predictive are these study variables. Perhaps different variables, however, would present another story.

In summary, the self-report variables were reliable and, to varying degrees, predictive. This method of monitoring, consequently, receives support from two important types of evidence.

In Table 3, the means and standard deviations of the ten study variables and the two tests are reported. An ANOVA was conducted upon each variable and test separately. Although some *F* values approached significance, none reached it. This, of course, does not mean that there were no differences. Had one predicted specific differences, some tests would have been significant. For example, one might have predicted that factual postquestions would dispose subjects to study in a more detailed and isolating fashion, to memorize rather than synthesize. On variable 2, a *t* test between the control group and the factual group would have been significant, however illegitimate the test is now, $t(24)=2.54, p<.02$, two-tailed test. The sensitivity of the monitoring variables could probably have been increased by phasing the variables more concretely and specifically or by making sure they were appropriate for the treatment conditions. On the other hand, this might be the wrong type of data for impressive differences. That is, the treatment conditions might have presented a situation that polarized subjects on the variables presented.

TABLE 3
MEANS AND STANDARD DEVIATIONS
OF STUDY VARIABLES AND TEXT SCORES

Groups	Study Dimensions										Tests	
	1	2	3	4	5	6	7	8	9	10	Organi- zation	Recall
Control												
Mean	29.7	37.6	31.5	36.5	23.5	31.9	41.1	25.8	27.9	30.9	15.3	12.5
SD	7.5	8.2	8.0	9.4	9.8	9.2	7.8	6.2	4.6	7.5	6.2	6.3
Prequestions												
Mean	30.9	33.2	33.9	35.9	22.7	25.8	35.5	31.5	26.5	29.5	10.9	10.1
SD	10.6	12.0	8.9	12.0	9.8	12.2	10.2	10.4	6.8	9.7	6.7	5.3
Postquestions												
Mean	33.3	29.4	28.5	38.6	28.8	26.8	33.8	29.7	29.5	29.6	15.7	13.2
SD	11.9	11.4	10.2	8.4	11.2	11.1	10.9	8.7	8.7	5.9	4.7	5.0
Factual Questions												
Mean	32.9	29.6	31.5	37.0	22.9	27.5	36.4	32.7	30.5	29.8	11.7	9.2
SD	7.8	7.9	7.5	8.2	11.0	8.4	9.4	8.1	6.4	6.4	5.8	4.1
Organizer												
Mean	29.3	36.6	34.6	38.1	26.4	27.3	36.4	34.1	23.2	33.4	15.4	12.6
SD	11.9	8.7	8.5	11.5	8.3	9.6	9.6	10.0	7.2	7.2	6.6	5.7

TABLE 4
CORRELATIONS AMONG STUDY VARIABLES

Variable Pairs	Groups					
	Factual	Pre-Question	Control	Post-Question	Organizer	All Combined
1-2	-.53*	-.29	-.34	-.69**	-.32	-.46**
1-3	-.42	-.37	-.35	-.90**	-.77**	-.60**
1-4	.72**	-.12	.07	.77**	.72**	.42**
1-5	.34	.53*	.51*	.49*	.58*	.48**
1-6	-.64**	-.13	-.25	-.85**	-.34	-.44**
1-7	-.13	-.28	-.10	-.63*	-.55*	-.40**
1-8	.58*	.46	.52*	.75**	.42	.50**
1-9	.37	.36	-.03	.47	.25	.35**
1-10	-.81**	-.06	.44	-.01	-.02	-.09
2-3	.52*	.75**	.23	.86**	.51*	.62**
2-4	-.50*	-.36	.14	-.54*	-.24	-.29**
2-5	-.54*	-.43	-.49*	-.38	-.57*	-.45**
2-6	.87**	.71**	.41	.68**	.25	.59**
2-7	-.08	.53*	.63*	.65**	.36	.47**
2-8	-.58*	-.43	-.46	-.55*	-.32	-.43**
2-9	-.30	-.53*	-.21	-.48*	-.04	-.39**
2-10	.77**	.38	-.02	-.30	.50	.29**
3-4	-.42	-.22	-.36	-.71**	-.38	-.40**
3-5	-.57*	-.70**	-.47	-.56*	-.61*	-.58**
3-6	.56*	.81**	.13	.79**	.34	.53**
3-7	.62*	.73*	.22	.66**	.20	.49**
3-8	-.63*	-.82**	-.66**	-.67**	-.29	-.51**
3-9	-.37	-.29	.40	-.44	-.17	-.28**
3-10	.42	.26	-.15	-.23	.28	.14
4-5	.15	-.10	-.05	.25	.54*	.17
4-6	-.59*	-.34	.05	-.83**	-.72**	-.47**
4-7	-.12	-.13	.34	-.57*	-.47*	-.22*
4-8	.62*	.09	-.13	.78**	.33	.30**
4-9	.34	.04	-.15	.21	.41	.17
4-10	-.68**	-.72**	.05	.34	-.05	-.26*
5-6	-.47*	-.50*	.07	-.38	-.36	-.33**
5-7	-.12	-.66**	-.43	.02	-.40	-.32**
5-8	.67**	.68**	.32	.30	.38	.44**
5-9	-.26	.10	-.45	.07	.39	.01
5-10	-.53*	.04	.30	.00	-.06	-.02
6-7	-.13	.59*	.23	.54*	.34	.39**
6-8	-.74**	-.69**	-.55*	-.74**	-.48*	-.64**
6-9	-.27	-.11	-.46	-.45	-.30	-.27*
6-10	.84**	.34	-.25	-.33	.12	.15
7-8	-.16	-.74**	-.52*	-.65**	-.52*	-.54**
7-9	-.47*	-.37	.18	-.25	.01	-.20
7-10	-.03	.11	.02	-.23	.25	.05
8-9	.07	.16	-.07	.29	.22	.10
8-10	-.74**	-.14	.40	.39	.13	.01
9-10	-.26	-.46	-.34	-.07	.27	-.21*

Table 4 records the correlations between variables for each group individually and for the groups as a whole. The question of interest, in perusing this table, is whether or not treatments influenced the way variables were related or put together to compose the varying experiences expected from different treatment conditions. Correlations can differ either in pattern or intensity. For example, the relation between interest (variable 1) and locus of control (variable 10) for the

factual group is different in kind or pattern. Correlations for other groups were either negligible or positive. Thus, for the factual group only, there is a strong relation between degree of interest and locus of control. That is, the more interested a subject was in the material, the more he or she attributed understanding to his/her own efforts. Consequently, in future studies, locus of control might prove to be an important variable in determining how subjects will react to factual postquestions. A difference in intensity by contrast, is based upon strength of correlations. For example, disregarding sign, we might consider only the strength of the correlations involving variable 10. Upon inspection, it is apparent that, for the factual group only, locus of control was strongly coordinated with other variables in composing the total experience. It tended to be rather negligible or circumscribed in other groups. What this might mean is that the factual condition highlights locus of control as a more central attribute of the experiential condition. That is, assuming an internal or external locus of control would have many more implications for positions assumed on other variables. While there are a number of interesting similarities and differences in this table, it would be tedious to elaborate further. However, the overall patterns and intensities of group correlations can be compared more directly.

To compare the patterns of correlations, the columns in Table 4 were correlated. First, however, the negative signs were minimized; that is, by reversing the poles of variables 1, 4, 5, 8, and 9, the majority of correlations became positive. This was done to avoid artifactually inflating the resulting correlation. Second, correlations were squared and multiplied by 100 to make them additive, and consequently, suitable as scores. Signs were preserved in this operation. Table 5 records the correlations among the sets of group correlations. The factual group tended to be isolated, having little in common with the other conditions. The prequestion group showed considerable similarity in correlational pattern with the control group. Both related more weakly to the conceptual postquestion group which, in turn, related more strongly to the organizer group. The least intrusive conditions resulted in a similar patterning of variables, the more intrusive conditions resulted in a similar patterning, and the factual emphasis resulted in a distinctive patterning. Thus it appears that treatment conditions were capable of altering the way variables were related.

TABLE 5
CORRELATIONS BETWEEN GROUP SETS OF CORRELATIONS
AMONG STUDY VARIABLES

Groups	Groups				
	1	2	3	4	5
1. Factual postquestion	X	.18	-.04	.07	-.05
2. Conceptual prequestion		X	.54	.25	-.01
3. Control			X	.39	.23
4. Conceptual Postquestion				X	.51
5. Organizer					X

To compare the strength of correlations, signs were disregarded. Table 6 records the median and quartiles for each set of correlations. As can be seen, the factual and postquestion groups manifested generally strong correlations relative to the organizer and control groups, with the prequestion group in the middle. For another perspective, the means and standard deviations for each set of correlations (squared and multiplied by 100) were: Conceptual postquestion, $M=29.70$, $SD=23.59$; factual, $M=26.18$, $SD=20.84$; prequestion, $M=21.09$, $SD=20.75$; organizer, $M=15.69$, $SD=14.44$; control, $M=11.40$, $SD=11.35$. Treatment conditions appear to have had a substantial effect upon the extent to which study variables were related. That is, the conceptual postquestion group studied in a tight, well-defined pattern, with nearly every variable operating in coordination with many others. By contrast, the control group studied in a looser, more ill-defined pattern. Another way of saying this is that members of the conceptual group showed ordered variation. The treatment condition tended to impose a pattern on the experience. Members of the control group showed more distinctiveness. There was much less pattern among members. What this suggests is that treatment varies in the extent to which it requires a uniform pattern of studying.

Potentially, this contextualistic approach to treatment conditions is very important, as the evidence suggests that different treatments lead subjects to cue on different variables and to cue in divergent ways. For example, the factual group seemed to cue on locus control, which may in turn, have cued other variables. As another example, there was a suggestion (i.e., weak correlations) that the control group studied more leisurely when focused, attuned to the discussion, while the conceptual postquestion group studied more intensely when focused. The pattern and strength of interrelationships has implications for the quality of the learning experience and the quality and quantity of learning products.

TABLE 6
MEDIAN AND QUARTILE CORRELATIONS FOR EACH
SET OF CORRELATIONS

Group	Q1	Median	Q3
Postquestion	.30	.49	.68
Factual	.27	.50	.62
Prequestion	.14	.37	.59
Organizer	.25	.34	.48
Control	.13	.32	.44

Discussion

This study is concerned with the potential usefulness of a method for monitoring learning experiences and activities in studying. To this end, the evidence demonstrates, first, that people judged their own activities and

experiences in a reliable fashion. Second, these self-reports were predictive of learning, particularly learning involving the organization of information rather than just recall of information. Predictive validity was particularly strong for the control group. Five of ten correlations with organizational learning were significant, and some others could probably be made significant with higher number of subjects. This evidence supports the assumption that self-reports provide a reliable monitor of variables that are important for learning.

A counter hypothesis might be that people have a reasonable idea of the amount of information they have learned. On this basis they might infer what they must have done, since at least some of the variables are clearly positive versus negative. However, this hypothesis does not take into account the variability of individual judgments. Students did not, in fact, rate sections in the same way. They varied, and many varied considerably, presumably in response to treatment, the material, and other factors.

Study variables also appeared to be highly sensitive to treatment condition. Predictive validities varied according to treatment. The pattern and strength of correlations among study variables also varied according to treatments. Perhaps this is not sensitivity, but merely random fluctuation. For example, the average variance in common among correlations ranged from 11.40 for the control group to 29.40 for the conceptual postquestion group, but this is not the sort of fluctuation one would expect from random samples. It constitutes a very large difference, indeed.

Probably the fairest judgment of these data is that they support the possibility of using this type of monitor more widely in studies of textbook learning. The method cannot be adequately assessed in but a single experiment, but rather will require converging evidence from a number of experiments. To this end, the data from this beginning investigation are encouraging and interesting.

From the hindsight of experience, however, a few pieces of advice might be appropriate. Among other things, a researcher might use this monitor to test hypotheses or to check to see if a treatment produced the effects that were thought to produce better learning. In this context, it would be advisable to use variables that are phrased as concretely as possible. It would probably be even better to break an abstract variable into two or more very concrete operations and sum these together. For example, variable 3 (felt focused, attuned to the discussion) could have been operationalized one way as the extent to which a person was aware of other people and things while reading. Another operationalization might involve the extent to which a person could or did follow the author's points without having to review, putting effort into it, reaching an impasse, becoming confused, and the like. Second, a researcher would naturally want to select variables that tested a theory or were appropriate and important for distinguishing among treatments. (Incidentally, this was not a concern in this experiment. The variables were selected because of their general prominence in educational research). However, as a check upon target variables, it would be desirable to have variables that are irrelevant to treatment, not apt to be affected by varying conditions. This may not even be possible, but would be worth a try. Last, the wisdom of using bipolar variables may be questioned, in some experiments, because bipolarity might establish a positive/negative bias, or prejudice and restrict the variable under investigation. Bipolarity helps to clarify exactly what is being asked, but perhaps at too high a price for some types of research.

In summary, the self-report method appears to be a reasonable way to monitor what subjects are doing and undergoing when they are studying. In making explicit unobservable happenings, the method offers a way to test hypotheses, check bases for treatment effectiveness, provide a richer picture of learning or what is happening between the beginning and the end of experiments, and perhaps develop a phenomenology of learning experiences.

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GLADYS STYLES JOHNSTON

Rutgers University

CAROL CAMP YEAKEY

Yale University

and

ROBERT A. WINTER

Montville Public Schools

A Study of the Relationship Between The Job Satisfaction of Principals and The Perceived Level of Teacher Militancy

Building principals are the incumbents of leadership positions in the educational organization and are vital to the success of their clients. This study assessed whether there were significant differences in the level of job satisfaction, autonomy, esteem, and self-actualization experienced by principals who perceived a high level of teacher militancy and those who perceived a low level of teacher militancy in their respective schools. Differences in the level of teacher militancy perceived by principals in urban, rural, and suburban schools were also investigated. In addition, the study explored whether principals perceiving either a high or a low level of teacher militancy had significant differences in their preference for a type of organization to represent their rights and interests. Statistical tests utilized included the analysis of variance, chi square, and a factor analysis appropriate to the evaluation of the hypotheses.

Research findings suggest that the increasing militancy of teachers and the growing strength of teacher organizations have diluted the authority of the building principals and eroded their managerial powers (Wildman & Perry, 1966; Barea, 1977; Kline & Thomas, 1974; Wildman, 1964). The major objective of this

Gladys Styles Johnston is presently Chairperson and Associate Professor of the Department of Administration and Supervision at Rutgers University Graduate School of Education. Her areas of concentration are organizational theory and behaviour and curriculum and instruction.

Carol Camp Yeakey, on leave from Purdue University as Assistant Professor of Administration and Higher Education, is presently a Rockefeller Fellow at Yale University's Bush Center for Child Development and Social Policy. Her areas of concentration are school policy and decision-making and organizational theory and behaviour.

Robert A. Winter is Superintendent of Schools in the Montville Public School District in Montville, New Jersey. His areas of concentration are management and collective negotiations.

study was to examine how the perceived level of teacher militancy relates to the level of job satisfaction of the building principal. Job satisfaction is defined as the measure of one's need fulfillment in the workplace. The influence of mediating factors, including grade level, and other organizational variables and demographic characteristics, was studied. Whether teachers and principals both sought to fulfill their higher order needs (social, esteem, and self-actualization) was also assessed. Thirdly, data regarding the desire of building principals to have their rights and interests represented by various types of organizations or through a management team were also investigated.

Pertinent Research Literature

Getzels and Guba suggested that conflicts related to the fulfillment of a role may arise in three ways: as a result of disagreement within the referent group defining the role; disagreement among several referent groups with each having a right to define expectations for the same role; and contradictions in the expectations of two or more roles which an individual may occupy at the same time (Getzels & Guba, 1957). Recognizing the importance of the building principal in the school's formal hierarchical organization, it is essential that the incumbent of this position assume a leadership role. Leadership as described by Lipham involves "the initiation of a new structure or procedure for accomplishing an organization's goals and objectives" (Lipham, 1964, p. 22).

The expansion of public employee unionism has been a rapid and extensive post-World War II phenomenon. The emergence of public employee unionism has been attributed to a variety of factors such as supportive legislation, union competition for membership, rampant inflation, increased demand for government services, and the publicity given to union gains and success in the private sector (Cohany & Dewey, 1972). More specifically, teacher militancy, that is the aggressiveness of teachers to bargain for their collective good, has been attributed to the drive for professionalization and autonomy culminating in a greater voice in school decision-making; the desire for more money and benefits; a defensive reaction to widespread criticism and disenchantment with massive student underachievement; the NEA/AFT rivalry; the increasing percentage of males in the teaching force; and the era of political activism in which collective action, demonstrations, and thrusts for power have been both prevalent and effective (Perry & Wildman, 1970). Furthermore, research by Giandomenico (1973) found that teachers' inability to obtain a desired amount of need satisfaction from their jobs also served as a catalytic force for aggressive collective action. Interestingly, the teachers who exhibited the greatest degree of militancy were less concerned with financial gains than with autonomy, esteem, and self-actualization.

It has been suggested that as a result of teacher militancy and unionization, building principals have experienced a loss of their administrative freedom to exercise judgment since the scope of teacher negotiations now includes such traditional areas of administrative discretion as class size, promotions, teacher assignments, transfers, nonteaching duties, and the length of the school day. General agreement exists among administrators that boards of education and teacher organizations, through collective agreements, have provided teachers with increased decision-making powers (Yeakey & Johnston, 1979) and some building principals apparently agree that their discretionary decision-making power to manage, operate, and direct has been severely eroded (Barea, 1977). Related

research by Butkiewicz (1973) assessed the impact of collective negotiations on secondary school principals and concluded that the functional role which was altered most by professional negotiations was the personnel management function. Butkiewicz noted that negotiated agreements had, in fact, diminished the number of unilateral decisions a principal could make in relation to policy development at the school level. Also, principals were forced to rely on input from a variety of sources before reaching a decision.

Operationally speaking, the initial impact of the negotiated agreement falls most heavily on the building principal, for it is at the building level that the primary responsibility for managing and adapting the school organization to the new power alignment resides. Research on factors affecting the development of worker participation in management has shown that managers resent having their decision-making power diluted by joint consultation or shared decision-making (Derber, 1970). On the other hand, however, teacher organization advocates counter that the militancy of teachers represents a search for professional control over their own areas of expertise.

Within the educational workplace, both teachers and principals seek to fulfill their needs and it is the gratification of those needs which result in an individual feeling positive about self. The traditional theory guiding research investigations on job satisfaction has been that "differences in job satisfaction reflect differences in the nature of the jobs or work situations of individuals" (Vroom, 1964, p. 172). Research on variables that affect the building principal's job satisfaction has demonstrated that the greater the principal's autonomy and role specificity, the greater his or her job satisfaction (Gross & Napier, 1967). However, few studies thus far have dealt with variables that have become highly visible with the involvement of collective bargaining for public school teachers.

Maslow proposed that the chief principle of organization in human motivational life is the arrangement of basic needs in an hierarchy of potency (Maslow, 1970). He postulated that as individuals satisfy their lowest level of need satisfaction, they are driven to a new level of satisfaction. Maslow assumed that human needs evolve in a predictable manner beginning with the lower order physiological and safety needs and progressing to the higher order social, esteem, and self-actualization needs. Physiological needs include homeostasis, hunger, sex, and thirst, while safety needs include security, stability, and freedom from fear and chaos. Social needs encompass love, affection, and belongingness, whereas esteem needs include the desire for achievement, independence, status, and recognition. Self-actualization encompasses needs of self-fulfillment, self-enhancement, and accomplishment as well as a desire to become all that one is capable of being.

Omitting the physiological needs, Porter adapted this hierarchy for the study of needs-satisfaction among management personnel. Porter's needs hierarchy included security, social, esteem, autonomy, and self-actualization (Porter, 1961). The autonomy level includes authority, opportunity for independent thought and action, participation in goal setting, and participation in the determination of job methods and procedures. Porter concluded that, at various managerial levels, the largest frequencies of need fulfillment deficiency occurred in the higher order need areas of esteem, autonomy, and self-actualization (Porter, 1962).

It is significant to note that although there is research analyzing individual need hierarchy and need satisfaction among management personnel, research, to

date, has not assessed variables that affect building principals' job satisfaction since the evolvement of collective bargaining for public school teachers. In essence, there is little existing knowledge concerning the relationship between collective negotiations and the job satisfaction of building principals. Both Maslow and Porter assumed that a general need structure was universally distributed among the human populace. The fact that school principals, as middle management administrators, perceive a loss of their administrative prerogatives may impact negatively on the job satisfaction of these administrators. To assess the effect of teacher militancy on the building principal's job satisfaction, the following hypotheses were formulated:

1. There is no significant difference between the level of job satisfaction of principals who perceive a high level of teacher militancy in their buildings and principals who perceive a low level of teacher militancy in their buildings.

Two sub-hypotheses were constructed to assess differences in principals' job satisfaction as a function of their employment in a specified community type or instructional level.

- 1a. There are no significant differences among the levels of job satisfaction of principals in rural, urban, or suburban schools.
- 1b. There are no significant differences among the levels of job satisfaction of principals of elementary, middle/junior, or high schools.
2. There is no significant difference between the esteem score of principals who perceive a high level of teacher militancy in their buildings and principals who perceive a low level of teacher militancy in their buildings.
3. There is no significant difference between the autonomy score of principals who perceive a high level of teacher militancy in their buildings and principals who perceive a low level of teacher militancy in their buildings.
4. There is no significant difference between the self-actualization score of principals who perceive a high level of teacher militancy in their buildings and principals who perceive a low level of teacher militancy in their buildings.
5. There is no significant difference in the preference of principals who perceive a high level of teacher militancy in their schools and principals who perceive a low level of teacher militancy in their schools with regard to having their interests and rights represented by a management team, an administrators' association, or an administrators' union.
6. There is no significant difference between the levels of perceived teacher militancy among principals from urban, suburban and rural communities.

Methodology

A stratified random sample of 45 building principals was selected from three counties in the northeastern region of the United States. The three counties were selected because they geographically provided a cross-section of rural, suburban, and urban subjects pertinent to the study. The sample was stratified to ensure that 15 of the participants would be from each of three community type designations (rural, suburban, and urban). The sample was further stratified to ensure representation of building principals from elementary (K-5, K-6), middle/junior (6-9), and high school (9-12, 10-12) levels. Ninety-one percent of the

building principals were male with 9.5 average years of experience. The average years of service in their current position was 6.6 years. Principals' rights and interests were represented through a variety of media including unions, professional administrators' associations, and management teams.

Instrumentation

Three instruments, the Minnesota Satisfaction Questionnaire, the Attitudinal Militancy Scale, and a personal data form were used. The instruments were selected because of their high level of reliability, their content validity, and the efficiency with which they could be administered.

The Minnesota Satisfaction Questionnaire (Weiss, Davis, England, Lofquist, 1967), a 100-item self-administered instrument, was designed to measure satisfaction with specific aspects of work and work environments. The following choice among five responses was provided on a scale of 1 to 5 for each item: (1) Very dissatisfied; (2) Dissatisfied; (3) Neither satisfied nor dissatisfied; (4) Satisfied; and (5) Very satisfied. The alpha coefficient of reliability was computed to be 0.86.

The Attitudinal Militancy Scale (Wohnsiedler, 1975) was used to measure the level of teacher militancy in those schools where collective bargaining had been implemented. The following choice of five responses was provided for each item on the scale: (1) Strongly agree; (2) Agree; (3) Undecided; (4) Disagree; and (5) Strongly disagree. A reliability coefficient of .93 was established for the instrument by use of the alpha coefficient. Directions for the completion of this scale by classroom teachers were modified for use by building principals in their assessment of the perceived level of teacher militancy in their schools.

Statistical tests included the analysis of variance, chi square and a factor analysis appropriate to the evaluation of the hypotheses. The hypotheses' testing required the dichotomization of the principals into those who perceived a low level of teacher militancy and those who perceived a high level of teacher militancy. These two groupings were established by using the mean teacher militancy score as cut-off point. A factor analysis of selected items from the Minnesota Satisfaction Questionnaire was conducted for the purpose of data reduction and to attempt identification of those items that would be related to the constructs esteem, autonomy, and self-actualization as defined by Porter.

Findings and Analysis

As Table 1 shows, the general job satisfaction scores of building principals who perceived a high level of teacher militancy and those who perceived a low level of teacher militancy were not found to differ in a statistically significant manner. Thus, the first hypothesis was supported insofar as the statistical analysis of the data demonstrated that the difference in mean scores could be due to chance alone. The failure to establish a significant difference between the general job satisfaction scores of the two principals' groups may be explained by viewpoints and conclusions cited in the literature. Butkiewicz (1973) found that many secondary school principals saw negotiated agreements with teacher organizations as having a positive effect on key areas of instructional leadership including teacher supervision, teacher inservice, and curriculum improvements. Although the

principals felt that their jobs were more difficult because of their responsibility in implementing the terms of such agreements, Butkiewicz surmised that these added responsibilities may have increased the respect and prestige of the principal. Thus, although principals may have lost certain managerial prerogatives, they now enjoy the clarification of rights and responsibilities that have resulted from comprehensive written agreements and such clarification has served to strengthen the job satisfaction of the principal (Gross & Napior, 1967).

TABLE 1
SUMMARY DATA AND ANALYSIS OF VARIANCE FOR THE
RELATIONSHIP BETWEEN GENERAL JOB SATISFACTION
AND PERCEIVED TEACHER MILITANCY

<i>Group</i>	<i>n</i>	<i>M</i>	<i>SD</i>	
Low Militancy	24	75.83	6.93	
High Militancy	21	77.38	10.19	
<i>Source</i>	<i>Degrees of Freedom</i>	<i>Sum of Squares</i>	<i>Mean Squares</i>	<i>F Ratio</i>
Between Groups	1	26.86	26.86	0.36*
Within Groups	43	3178.28	73.91	
Total	44	3205.14		

* not significant $p<.05$

TABLE 2
SUMMARY DATA AND ANALYSIS OF VARIANCE FOR THE
RELATIONSHIP BETWEEN GENERAL JOB SATISFACTION
AND COMMUNITY TYPE

<i>Group</i>	<i>n</i>	<i>M</i>	<i>SD</i>	
Urban	15	76.00	8.09	
Suburban	15	78.60	8.28	
Rural	15	75.07	9.37	
<i>Source</i>	<i>Degrees of Freedom</i>	<i>Sum of Squares</i>	<i>Mean Squares</i>	<i>F Ratio</i>
Between Groups	2	100.61	50.31	0.68*
Within Groups	42	3104.53	73.92	
Total	44	3205.14		

* not significant $p<.05$

In regard to the differences between the general job satisfaction scores of building principals from urban, suburban, and rural communities, hypothesis 1a was supported. However, as reflected in the summary data in Table 2, the difference in scores was found to be not statistically significant. It was anticipated that the principals' levels of job satisfaction would improve as one progressed from the urban to the rural community type. Hypotheses 1b was also supported although the general job satisfaction scores of principals from the three specified levels did not differ significantly as shown in Table 3. The results of hypotheses 1a and 1b differ from Mifflin's research (Mifflin, 1975) which demonstrated that urban school principals experienced a much lower level of job satisfaction than their suburban and rural counterparts. Similarly Mifflin's finding that elementary school principals enjoyed a much higher level of job satisfaction than secondary school principals was not replicated by our study. Mifflin's views, however, may reflect a regional bias and be inappropriate for generalization to areas outside of the sample selected.

TABLE 3
SUMMARY DATA AND ANALYSIS OF VARIANCE FOR THE
RELATIONSHIP BETWEEN GENERAL JOB SATISFACTION
AND INSTRUCTIONAL LEVEL

Group	n	M	SD
Elementary	15	75.00	8.10
Middle/Junior	15	76.00	9.91
High	15	78.67	7.58

Source	Degrees of Freedom	Sum of Squares	Mean Squares	F Ratio
Between Groups	2	107.81	53.41	0.73*
Within Groups	42	3097.33	63.75	
Total	44	3205.14		

* not significant $p < .05$

It is important to note here that the view is often propagated that school professionals working in the urban school environment are disheartened, disillusioned and unfulfilled, that their professional needs are not being met under the weight of awesome social, political, educational, and economic impingements on their work. On the contrary, our study has shown no significant difference in principals' job satisfaction in either community type. What perhaps has evolved is a new type of urban school administrator who has the experiential background and unique expertise to work with a diversified populace. As research by Johnston, Yeakey and Holden (1979) has indicated, the turmoil of the sixties demanded and secured a new kind of administrator who, far from being overwhelmed by urban school dynamics, was creatively challenged by them. The resultant impact on job satisfaction is obvious.

The data in Table 4 illustrate that, on the average, the esteem factor scores of building principals who perceived a high level of teacher militancy in their buildings were not significantly different from the esteem factor scores of building principals who perceived low levels of teacher militancy. The second hypothesis was therefore supported. Several reasons might account for this outcome. Building principals may have found alternative means of fulfilling their esteem needs, irrespective of the level of teacher militancy in their schools, or the higher order esteem needs of principals may be either latent or unfulfilled because of the prepotency of lower order needs. Also, perceived teacher militancy might have little or no impact on the level of esteem experienced by the building principal since militant teachers and their organizations are, at least initially, concerned with salaries, benefits, and other lower order needs. Our finding might also be explained by the opinions expressed by a high percentage of principals who indicated support for teachers' right to bargain collectively. Such favourable attitudes may reflect the principals' desire for similar recognition or reflect a measure of empathy since all principals were former teachers.

TABLE 4
SUMMARY DATA AND ANALYSIS OF VARIANCE
FOR THE RELATIONSHIP BETWEEN ESTEEM
AND PERCEIVED TEACHER MILITANCY

<i>Group</i>	<i>n</i>	<i>M</i>	<i>SD</i>
Low Militancy	24	34.83	4.67
High Militancy	21	36.14	6.24

<i>Source</i>	<i>Degrees of Freedom</i>	<i>Sum of Squares</i>	<i>Mean Squares</i>	<i>F Ratio</i>
Between Groups	1	19.20	19.20	0.65*
Within Groups	43	1280.00	29.77	
Total	44	1299.10		

* not significant $p < .05$

As shown in Table 5, the autonomy factor scores of the building principals who perceived a high level of teacher militancy were not significantly different from the autonomy factor scores of building principals who perceived lower levels of teacher militancy. The third hypothesis was therefore supported. These results encourage further investigation as to whether the building principals' autonomy need is being fulfilled. Similar to our discussion of the second hypothesis finding, it might be that militant teachers and their organizations have been concerned primarily with lower order needs, salaries, fringe benefits, and have not yet infringed upon the managerial prerogatives of the building principals at the high order need level. Willower's (1975) research of militant and non-militant districts with regard to teacher organization influence on decision-making is supportive of this position.

TABLE 5
SUMMARY DATA AND ANALYSIS OF VARIANCE
FOR THE RELATIONSHIP BETWEEN AUTONOMY
AND PERCEIVED TEACHER MILITANCY

<i>Group</i>	<i>n</i>	<i>M</i>	<i>SD</i>	
Low Militancy	24	46.96	4.96	
High Militancy	21	46.38	6.52	
<i>Source</i>	<i>Degrees of Freedom</i>	<i>Sum of Squares</i>	<i>Mean Squares</i>	<i>F Ratio</i>
Between Groups	1	3.73	3.73	0.11*
Within Groups	43	1413.91	32.88	
Total	44	1417.64		

* not significant $p<.05$

Analysis of the data in Table 6 shows that the self-actualization factor scores for the two groups of building principals were not significantly different. The fourth hypothesis was also supported. This finding may reflect, as did our finding with the second and third hypotheses, that teachers and their organizations have not interfered with the approaches used by a building principal to fulfill his higher order self-actualization needs. Teacher unionism, still in an embryonic stage of growth in the schools sampled, may be primarily concerned with fulfilling the lower order needs of their membership.

TABLE 6
SUMMARY DATA AND ANALYSIS OF VARIANCE FOR THE
RELATIONSHIP BETWEEN SELF-ACTUALIZATION
AND PERCEIVED TEACHER MILITANCY

<i>Group</i>	<i>n</i>	<i>M</i>	<i>SD</i>	
Low Militancy	24	48.83	4.04	
High Militancy	21	49.00	8.35	
<i>Source</i>	<i>Degrees of Freedom</i>	<i>Sum of Squares</i>	<i>Mean Squares</i>	<i>F Ratio</i>
Between Groups	1	0.33	0.33	0.01*
Within Groups	43	1769.33	41.14	
Total	44	1769.66		

* not significant $p<.05$

While it is true that principals view the negotiated agreement as limiting their discretionary powers, they also feel that negotiated agreements increase their duties and responsibilities. Almo (1974) reported that 86 percent of the principals included in his study believed that collective bargaining was making their lives more difficult. However, Almo also found that principals saw themselves as capable individuals with the ability to find the appropriate means necessary to carry out their job responsibilities effectively. The inherent opportunity for growth and the challenge in successfully executing new and varied duties may have contributed to a feeling of accomplishment and self-fulfillment. The intricacies and complexities resulting from contractual stipulations may have provided the type of creative growth experiences necessary for self-actualization and self-enhancement.

As Table 7 shows, principals' preference for a particular structure for the representation of their own rights and interests was not significantly different whether the principal perceived a high or low level of teacher militancy. The fifth hypothesis was supported. Perusal of the data regarding the preferences of participating principals for representation of their rights and interests through specified structures revealed strong support for both the professional organization and management team structures. It appeared that principals were not strongly in favour of establishing unions, although professional associations representing building principals have adopted many union practices.

TABLE 7
CHI SQUARE SUMMARY DATA FOR THE RELATIONSHIP BETWEEN
PRINCIPALS' PREFERENCE FOR TYPE OF REPRESENTATIVE
STRUCTURE AND PERCEIVED TEACHER MILITANCY

Type of Representative Structure	Level of Militancy	First Preference	Second Preference	Third Preference	Other	Total for Each Group
Management Team ^a	High	7 (15.6%)	9 (20.8%)	5 (11.1%)	0 (0.0%)	21
	Low	12 (26.7%)	8 (17.8%)	4 (8.9%)	0 (0.0%)	24
Union ^b	High	2 (4.4%)	1 (2.2%)	14 (31.1%)	4 (8.9%)	21
	Low	1 (2.2%)	3 (6.7%)	17 (37.8%)	3 (6.7%)	24
Professional Association ^c	High	11 (24.4%)	9 (20.0%)	1 (2.2%)	0 (0.0%)	21
	Low	9 (20.0%)	13 (28.9%)	1 (2.2%)	1 (2.2%)	24
Other ^d	High	1 (2.2%)	2 (4.4%)	1 (2.2%)	17 (37.8%)	21
	Low	2 (4.4%)	0 (0.0%)	2 (4.4%)	20 (44.4%)	24

^a $\chi^2 = 1.29$

^b $\chi^2 = 1.57$

^c $\chi^2 = 1.73$

^d $\chi^2 = 2.72$

The data in Table 8 reflects that the perceived level of teacher militancy was significantly different ($p < .05$) for principals in urban, rural, and suburban community types. Hypothesis 6 was therefore rejected. This finding demonstrates a correlation between the perceived level of teacher militancy and the community type. Moore's (1974) research supported this finding and proposed that the level

of teacher union membership was related to the general level of organized labour strength in a region. Urban areas with far greater private sector union organization than suburban or rural communities, also experience far greater public sector union organization.

TABLE 8
SUMMARY DATA AND THE ANALYSIS OF VARIANCE FOR THE
RELATIONSHIP BETWEEN PERCEIVED TEACHER
MILITANCY AND COMMUNITY TYPE

<i>Group</i>	<i>n</i>	<i>M</i>	<i>SD</i>	
Urban	15	135.47	23.12	
Suburban	15	124.20	18.52	
Rural	15	110.87	25.13	
<i>Source</i>	<i>Degrees of Freedom</i>	<i>Sum of Squares</i>	<i>Mean Squares</i>	<i>F Ratio</i>
Between Groups	2	4549.35	2274.68	4.52*
Within Groups	42	21133.82	503.19	
Total	44	25683.17		

* significant $p < .05$

Situational Data

Data demonstrated that teachers in 37 (82.2%) of the school buildings were represented by a regional affiliate of the National Education Association, 6 (13.3%) were represented by the American Federation of Teachers, and 2 (4.4%) cited other representation without additional clarification.

Forty-seven percent of the building principals were represented by professional associations. An additional 24 percent claimed representation through a management team. Eighteen percent of the building principals indicated that they were represented by unions.

The building principals had a range of experiences with regard to teacher militancy: 80% of the principals had experienced an informal grievance, 69% had dealt with formal grievances, 35% had experienced some type of teacher job action. Of the ten principals that had experienced strikes, 80% of them were from urban districts.

It is interesting to note that building principals were involved in the teacher negotiations process. Viewpoints of 69% percent of the building principals were represented indirectly in the negotiations process by their superintendents. The remaining 31 percent of the respondents had direct participation in teacher negotiations through review of the proposed contract prior to ratification or through actual representation at the negotiating sessions by a principal from the district. This participation in the negotiations process, far from lessening the

principals' managerial prerogatives, may have indeed enhanced them and significantly influenced the outcome of this study.

Summary

In summary, building principals appeared to be fulfilling their needs in districts where a high level of teacher militancy was perceived and in districts where a low level of teacher militancy was perceived. In essence, the aggressive drive by teachers for their collective good did not significantly affect the job satisfaction of the building principal. These results might have been influenced by clarification of roles provided by comprehensive master contracts, by the success principals have enjoyed in coping with new administrative challenges, and because teacher organizations may have been more concerned with lower order needs such as salaries and fringe benefits than with higher order needs (autonomy, esteem, self-actualization). Perhaps in the fulfillment of the higher order needs, teachers would more directly challenge the administrative prerogatives of the school principal. The experience of the principals (as well as their direct and indirect involvement in the negotiations process) might also have influenced the study's findings.

Our findings suggested that teacher militancy may have had little impact on the job satisfaction of principals because the teacher organizations might have been more concerned with salaries and fringe benefits than issues directly influencing school policy and decision-making. Teacher unions in their nascency and embryonic stages are initially concerned with grievance procedures, recognition, salary, fringe benefits, organizational rights, impasse resolutions, extra-pay duty, and specific working conditions. But the practical effect of collective bargaining has been to grant teachers a greater measure of control over decisions of management. In those school districts which have been negotiating for twelve or more years, the teacher unions have been highly successful in expanding the scope of bargaining to include educational policy issues heretofore settled by the unilateral preserve of school administrators (Yeakey & Johnston, 1979). Thus, we suggest that the age or longevity of the teacher organization might have an impact on the job satisfaction of school principals. Again, the older and more mature teacher organizations have greatly expanded their settlements to the school policy arena, which would directly impinge upon the principals' managerial latitude. Because our study did not control for the age or longevity of the teacher unions, a comparative study which would take into account that variable might yield some interesting results. Therefore, should this study be replicated, we would recommend that a contrastive study be conducted among principals in districts which have been involved in collective negotiations for at least fifteen years and among school principals in districts which have been involved in teacher negotiations for no more than four years.

Moreover, we note that teacher organizations which have been successful in expanding the scope of negotiations are not only older but more powerful as well, irrespective of state laws which might limit the scope of bargaining. For example, New York City, in addition to the legal jurisdiction of the state collective bargaining statute, the Taylor Law, has a city law that restricts the scope of negotiations, the New York City Administrative Code 1173-4.36. Yet, New York City's United Federation of Teachers, which comes under this law, is considered to represent the epitome of teacher union power and strength in the policy and

decision-making arena (Cheng, 1976). Research could attempt to assess those variables which make certain teacher organizations relatively more powerful than others. A companion study could then analyze the job satisfaction of principals who are employed in schools and school districts that have varying degrees of teacher union power and strength.

Finally, a new development is being evidenced in teacher negotiations today that reflects the financial stringencies of most school districts. The escalating costs of basic school functioning and the poor financial condition of most school districts may preclude higher wages, salaries, and other lucrative monetary gains for teachers. As the economic picture becomes more bleak, we foresee the time when school districts, having little monetary reserve, will begin to bargain away, out of necessity, issues directly impinging upon managerial rights. The ensuing effects of this development on the job satisfaction of principals, in particular, and overall school management, in general, might generate some highly useful research findings with dire implications for all involved in the schooling process.

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DAIYO SAWADA

and

THOMAS P. ATKINSON

The University of Alberta

Children's Difficulties with Base Ten Numeration Simulated for Prospective Elementary Teachers

In preservice course work dealing with mathematics methods, it is often difficult to motivate students to think seriously about and to be appreciative of the subtlety of beginning number work in the early grades. The present study, by using a specially designed nondecimal numeration system, attempted to simulate difficulties that grade school pupils may have in learning base ten numeration. Using a pretest-posttest design with experimental and control groups, significant effects in favour of the simulation were found. Interview data were collected and reported in an attempt to explore further the impact of the simulation as revealed in the significant pre-post differences.

Teaching students something they know little about is a difficult task; teaching them something about which they know everything is an even more difficult task. Whatever truth resides in the above statement forms the motivation for the present study.

In teaching mathematics methods courses aimed at the general student in an elementary school teacher preparation program, the authors repeatedly encountered resistance, unconscious or otherwise, from students who were asked to devote their minds to activities concerned with basic concepts of base ten numeration. The students are so thoroughly familiar with the system that

Thomas P. Atkinson and Daiyo Sawada are professors in the Department of Elementary Education at the University of Alberta, with responsibilities in the provision of the mathematics education component of preservice teacher preparation. A constant focus of their attention has been, and continues to be, the development of teaching strategies which force students to search beyond the obvious in understanding the basic processes of mathematics.

everything is automatic, so automatic that no thought needs to be expended. It is thus very difficult for such students to become aware of any problems grade school pupils may have in understanding numerals. Even working with elementary school pupils having numeration difficulties is insufficient to bring home the basic complexity of thought involved in the numeration system, for the difficulty is frequently attributed to the child, not to the complexity of the system. The basic problem is neatly summed up by Gattegno's phrase, "the obvious escapes." This phrase encapsulates the idea that students think they know everything there is to know about the counting numbers, the names we say, and the symbols we write, when in fact a little probing soon reveals that they have little or no *insight* into the system. The obvious has escaped. For the most part, students use the system by rote, have learned it by rote, and unfortunately are likely to teach it by rote in the same manner unless they come to realize that the obvious has eluded them.

Among several approaches employed by the authors to help students recapture the obvious is the use of a specially constructed numeration system. A nondecimal numeration system with completely new numerals and number names is outlined for students. They are then requested to develop the system further so that in all fundamental ways it behaves like the base ten system they know. One of their initial tasks is to write down the first few counting numbers. The first double digit numeral provides untold difficulty for more students than one would expect. Such difficulty undergirds the basic assumption of the simulation used in the present study: when students are let to struggle (and struggle is the correct word) with the continued construction of a new numeration system, the difficulties they encounter sensitize them to be more alert to and appreciative of the problems children have experienced with base ten numeration. Such difficulty leads them to recapture the obvious.

The above strategy for recapturing the obvious has no doubt been tried by many mathematics educators in preservice courses. To our knowledge, however, it has been formally assessed and reported upon on only two occasions. Hamilton (1961) developed and used a base six system with completely new symbols and names. Using a pretest-posttest design involving experimental and control groups, he obtained significant differences in favour of the base six materials over the base ten materials on a 47-item numeration test covering regular base ten arithmetic. A four-year follow-up questionnaire revealed that the prospective teachers (now regular classroom teachers) still considered the original base six experience as very worthwhile and recommended its continued usage in the preservice program. Six years later, Haukebo (1967) used three different bases (octagonal, binary, and duodecimal) with prospective elementary teachers over a three-week period. In contrast to Hamilton, he did not obtain results supportive of the use of nondecimal numeration as a means of enhancing understanding of base ten numeration. Given that Hamilton did not achieve significant results until his second experiment, there seems to be need for caution in making blanket recommendations concerning the use of nondecimal numeration activities in mathematics methods courses. Accordingly, it seemed appropriate and timely to examine again the role of other bases in work on numeration for prospective teachers.

TABLE 1
A COMPARISON OF THE HAMILTON AND SAWADA/ATKINSON
NONDECIMAL NUMERATION SYSTEMS

Hindu-arabic numeral	Hamilton		Sawada/Atkinson	
	numeral	name	numeral	name
0	0	um	0	zip
1	1	la	1	alt
2	2	le	2	bik
3	3	li	3	cor
4	4	lo	4	dat
5	5	lu	5	(alt) enn ¹
6	6	lum	6	(alt) enn alt
7	7	la lum	7	(alt) enn bik
8	8	le lum	8	(alt) enn cor
9	9	li lum	9	(alt) enn dat
10	10	lo lum	10	bik enns
11	11	lu lum	11	bik enns alt
12	12	lesy	12	bik enns bik
13	13	lesy-la	13	bik enns cor
14	14	lesy-le	14	bik enns dat
15	15	lesy-li	15	cor enns
16	16	lesy-lo	16	cor enns alt
17	17	lesy-lu	17	cor enns bik
18	18	lisy	18	cor enns cor
19	19	lisy-la	19	cor enns dat
20	20	lisy-le	20	dat enns
21	21	lisy-li	21	dat enns alt
22	22	lisy-lo	22	dat enns bik
23	23	lisy-lu	23	dat enns cor
24	24	losy	24	dat enns dat
25	25	losy-la	25	(alt) fiv
26	26	losy-le	26	(alt) fiv alt
27	27	losy-li	27	(alt) fiv bik
28	28	losy-lo	28	(alt) fiv cor
29	29	losy-lu	29	(alt) fiv dat
30	30	lusy	30	(alt) fiv (alt) enn
31	31	lusy-la	31	(alt) fiv (alt) enn alt
32	32	lusy-le	32	(alt) fiv (alt) enn bik
33	33	lusy-li	33	(alt) fiv (alt) enn cor
34	34	lusy-lo	34	(alt) fiv (alt) enn dat
35	35	lusy-lu	35	(alt) fiv bik enns
36	36	la mum	36	(alt) fiv bik enns alt

¹ entries in parentheses can be deleted for the sake of efficiency.

Method

In a broad sense, the present study was a replication of the Hamilton (1961) study with some key changes in the experimental treatment. As in Hamilton's study, a completely new place value system was developed with new number symbols and names; unlike Hamilton, the base chosen was five rather than six (it was decided that if the base was to be rather small, it should be prime). Table 1 lists the names and numerals used by Hamilton and the ones used in the present study.

The following points of comparison and contrast should be noted in Table 1.

1. Both systems have a base for grouping and use powers of the base to define place value for the digits within a numeral. However, Hamilton has incorporated the idiosyncrasies of the English language version of the names (see especially his "lum" numbers  through  corresponding to the "teen" numbers); the Sawada/Atkinson version eliminates all idiosyncrasies (historical accidents in the evolution of the development of the English language version), instead placing priority on the logical determination of names insofar as it is possible (see for example the names for the numbers , through ). By emphasizing the logical determination of all aspects of the system, the arbitrary conventions inherent in the English language version are seen for what they are — arbitrary conventions — something which cannot be seen if the system is approached by rote.
2. Both systems use mnemonic devices to decrease the load on memory in remembering and ordering the names for the single digit numerals: the vowels in Hamilton, alphabetic sequence in Sawada/Atkinson.
3. The systems differ in the structure of the digits. Hamilton's are essentially meaningless squiggles which are so much alike (four of the six are actually congruent) that learning them is made more difficult than should be. The Sawada/Atkinson digits possess strong tally meaning, thus facilitating the learning and the recall of the digits.
4. There are fewer basic facts in base five than in base six (44 fewer if all four operations are considered); yet there is a sufficient number to underscore the importance of mastering the basic facts (via games, puzzles, etc.) before algorithms can be effectively learned.

Design

The design consisted of a pretest-posttest arrangement used on experimental and control groups formed with random assignment of students. During the fall of 1978, 106 students enrolled in a semester course in elementary school mathematics methods. Of these, 30 were randomly chosen for the experimental treatment while the remainder were randomly partitioned into four groups of 19. Thus, for purposes of instruction, the four control groups were at an advantage if smaller class size makes any difference. Later on, for the purpose of data analysis, data from 11 randomly chosen students from three of the control groups were combined with the data from the remaining control group to provide a data set based on 30 control subjects to compare with the data from the 30 experimental subjects. Classes met three times a week for 50-minute periods. On Mondays, all 106 students attended a common lecture. On Wednesdays and Fridays, students broke up into the five smaller groups for laboratory activities and discussion. It

was during these small group sessions that the experimental group received the Sawada/Atkinson Numeration System materials while the four control groups worked with regular materials based largely on Kennedy's (1975) methods text in which there is a fair amount of nondecimal work which was neither stressed nor ignored in the control groups. The manipulative aids used in the experimental and control groups were the same except that base five blocks were used in the experimental group while only base ten blocks were available in the control situation. Since the control groups were somewhat smaller than the experimental group, control students may have had more opportunity to engage in experiences with manipulative materials. The basic methodology employed for all lab work for all groups could be described as guided discovery. The experiment was conducted over a period of four weeks during which the three mathematics topics under study were numeration, basic facts, and algorithms. The amount of time devoted to any one of the three topics was the same for all groups. However, with the experimental group, the instructor used both systems of numeration to illustrate basic facts and algorithms, whereas with the control groups, base ten numeration was used almost exclusively. The control groups were alerted to the existence of nondecimal systems using conventional numerals whereas the experimental group learned base five numeration through the medium of the Sawada/Atkinson system. One of the authors supervised the experimental group while the other, with the assistance of the third staff member, supervised the control groups.

TABLE 2
THE PRETEST AND POSTTEST QUESTIONS

1.	Write the numerals for the first fifteen counting numbers. Circle the numerals whose meaning depend on an understanding of a fundamental principle of numeration. State that fundamental principle.
2.	Do you think a grade one child of at least average intelligence would have difficulty in understanding the first of your circled numerals in question 1? State your reason(s).
3.	In reading the number 100 we say "one hundred" or "a hundred" or "hundred." In reading the number 10 we only say "ten." Explain why.
4.	What differences might exist in the thinking of a child (about grade 2) in computing $23 - 5$ as compared to $13 - 5$?
5.	One of the reasons for recommending the universal adoption of the metric system is the fact that it is based on ten. If our system of numeration had been base eight instead of base ten would the metric system be so attractive? State your reason(s).
6.	Carry out the following computations in the bases suggested: (a) 3×24 in base five. (b) 3×24 in base six. Show your work.

Instrumentation

Two basic and mutually supportive types of data were collected: (1) paper and pencil test data assessing understanding of decimal and nondecimal numeration and the impact of numeration on basic facts and algorithms, and (2) interview data assessing the impact of the laboratory activities on student awareness of difficulties children may have. The paper and pencil test consisted of 6 questions which were given in pretest and posttest form, the same 6 questions appearing in both tests. These 6 questions (see Table 2) were designed to assess whether the Sawada/Atkinson System resulted in any transfer for the purpose of developing insight into the base ten system.

Eight students each from both the experimental and the combined control groups were interviewed. These were selected so that four of the eight from each group were active participators in the lab activities while the other four were much less so. The basic questions in the interview were the same for both the control and experimental groups.

Analysis

The paper and pencil test data were handled in a somewhat novel way. The usual procedure would have been to use either an analysis of covariance with the pretest as a covariate, or to subtract the pretest from the posttest and conduct an analysis of variance on the difference scores. The weakness of difference scores as a metric has long been recognized. The weakness of the analysis of covariance in terms of external validity has only recently been recognized. To avoid both these weaknesses, it was decided to assess directly the difference between a subject's response on the pretest and his response on the posttest for each question. These directly assessed differences were then summed over the 6 questions to give rise to a criterion measure. The direct assessment was done blindly, so that the assessor did not know whether the data were from an experimental or a control subject. In order to acquire a measure of reliability of the assessment technique, both investigators undertook the assessment independently. A correlation coefficient between their scores was calculated and a value of 0.87 obtained. This value is higher than reliabilities usually obtained on difference scores. To increase the stability of the assessment scores even further, the scores given by each investigator were averaged for each student and these mean ratings were used as the criterion variable.

Results

Paper and Pencil Data

A simple t test was performed on the mean scores of the experimental and control groups. As shown in Table 3, the obtained t was significant at the 0.01 level indicating that the treatment had significant effects in the desired direction. An examination of the scores for each individual question showed that the experimental group demonstrated greater gain on all six questions, but especially on question 1, a result which is commented upon further in the discussion.

Interview Data

The major purpose for gathering the interview data was to ascertain in what specific ways the students learned from the experiences provided in the

experimental as compared to the control situation. In particular, it was anticipated that the experimental group, in working (struggling) with the special numeration system, would become much more aware of the thinking required in creating a new numeration system thus jarring them out of their too comfortable complacency. Question 1 deals with this. As shown in Table 4, the experimental group gave many more (11 vs. 4) specific responses to the question relating to the difficulties encountered by the student in working with the numeration activities.

TABLE 3
TEST OF TREATMENT DIFFERENCES

Source	Mean	df	t	Probability
Experimental group	2.73	1/58	2.64	0.01
Control group	1.65			

TABLE 4
INTERVIEW DATA: FREQUENCY OF SPECIFIC RESPONSES
GIVEN TO EACH QUESTION

Question	Frequency	
	Experimental Group	Control Group
1. What difficulties did you encounter in doing the activities?	11	4
2. Did the activities alert you to any difficulties children may have in learning base ten numeration?	25	7
3. In what ways did the manipulative materials help you in understanding numeration?	6	14

However, experiencing difficulty is not of particular value unless it makes the student aware of possible difficulties that children might have in understanding base ten. Thus, question 2 asks whether they became aware of difficulties children might encounter in learning base ten numeration. Again, Table 4 indicates that the experimental subjects were able to give many more specific suggestions (25 vs. 7). This rather large difference is taken as strong support for the effectiveness of the simulation.

Question 3 was asked for the purposes of control. In studies of the present kind in which different instructors are used for the experimental and control treatments, instructor differences in terms of effectiveness become viable alternate hypotheses for group differences. In order to get a reading on the possible operation of this confounding source of variance, students were asked question 3, dealing with a characteristic common to both treatments. The data indicate that the control group was able to generate more specific responses (14 vs. 6) than the experimental group when asked in what ways the manipulative aids helped in their learning. The superior performance by the control subjects suggests that the instruction given in the control situation could by no means be characterized as generally inferior to that given in the experimental situation, thus annulling, to some extent, the alternate hypothesis stated earlier. In retrospect, the superior performance of control subjects on question 3 was probably due, at least in part, to two facts: (1) the control groups had access to a wider variety of manipulative aids, (2) the control groups were considerably smaller than the experimental group, making experiences with manipulative materials easier to obtain.

Discussion

The evidence gathered in the present study shows rather conclusively that work with a nondecimal numeration system involving entirely new number symbols and names can lead to heightened awareness and appreciation of difficulties that children might have in understanding base ten numeration. Furthermore, not only did the experimental subjects show more insight into base ten (question 1), but they also learned to operate better with nondecimal bases using traditional notation than did control subjects (question 6). The transfer of insight to base ten was the underlying assumption of the simulation. That this assumption is valid is indicated by the results. It thus appears safe to infer that the use of a nondecimal numeration system such as the Sawada/Atkinson system has value when used in preservice teacher education. Such a conclusion is in concert with Hamilton's (1961) findings but at variance with those of Haukebo (1967). It is suggested that Haukebo's counter results were due, at least in part, to introducing too many different bases (octagonal, binary, and duodecimal) over a short period of time (3 weeks). It is likely that students mastered none of the nondecimal systems resulting in little or no transfer of insight to base ten. In the present study, as in Hamilton's, a three-week period or longer was devoted to one nondecimal system with greater benefit.

With the advance of metrickation and the current availability of hand-held calculators, a timely suggestion for further research would be to assess the efficacy of the study of a nondecimal numeration system in producing understanding of decimal fraction numerals for prospective teachers.

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IAN I. DOW

University of Ottawa

Participatory Supervision in Education: A Must for the Eighties

Recent trends in educational literature indicate that school administration is becoming more participatory. In particular, attempts at instructional improvement are relying more on human resources styles of supervision. It is suggested in this paper that a management by objectives model can provide an effective procedure for staff supervision. From the results of a study utilizing a modified management by objectives model which are presented, there is an indication that human resource development can be facilitated by utilizing such a model. Participants had a high commitment to the organization and high motivation to succeed. A modified management by objectives model appeared to hold great potential for implementing a participatory approach to management.

Research by Halpin (1955) and Blake and Mouton (1964) suggested that successful leaders employed a humanistic style of management. Recent research by Likert (1976) in his discussion of collaborative management support these findings. It is becoming more apparent that material resources cannot enlarge, that the additional output necessary for organizational success can be realized only by a fuller exploitation of existing human resources.

To achieve success in an educational institution, an organization must build a team, a true team in which individual efforts are welded into a common effort, where each member contributes something toward a common goal. Each position and each individual effort must be directed toward the objectives of the total enterprise. The value of each individual, subordinate and superordinate alike, must be measured in terms of the contribution he/she makes to the success of the total system. The manager must provide the leadership for that team.

Today we are being challenged by professional educators to examine new theoretical conceptualizations and to exercise more dynamic leadership in the instructional improvement process. There has been renewed interest in the theory and practice of instructional supervision during the past five years. During this

I. I. Dow, a former teacher and principal, is currently an associate professor of Educational Administration at the Faculty of Education, University of Ottawa. He has conducted extensive research in school supervision and organizational climate, and is currently conducting research in the area of special education with particular reference to gifted education.

time more than two dozen professional texts on instructional supervision have been published in North America. In addition dozens of articles have appeared in professional journals. There have also been many attempts to clarify the confusion associated with supervision and supervisors. Some discernible trends have appeared in the recent literature.

The concept of viewing supervision as a team approach, involving all personnel above the teaching ranks, has received some attention in recent years. Wiles and Lovell (1975) discuss this trend when they state that "instructional supervisory behaviour is assumed to be an additional administrative behaviour system formally provided by the organization for the purpose of interacting with the teacher behaviour system" (p. 6). Similarly, Alfonso, Firth and Neville (1975) refer to the "professional instructional team" (p. 36) as a pattern for the combining of diversified talents and efforts as a means of having a direct impact upon the school or unit with whom the team is working.

Another trend, suggested by Sergiovanni (1975) is to view the instructional improvement process as human resources supervision. This conceptualization is based on the assumption that identity, commitment, and motivation are essential ingredients in any practice in supervision. In this perspective it is assumed that teachers are professionals, that they want to improve themselves professionally, and that "teachers have a desire for and a need for full participation as shareholders in the affairs of the school and that they are prepared to work very hard on behalf of the school as they have the opportunity" (p. 12).

A further development is considerable agreement today that supervision is not the province of a particular person but is a natural part of the school organization. It must be a team approach involving all members of the instructional staff. The purpose of supervision was and still is to improve instruction. It is a process designed to facilitate pupil learning and to achieve the goals of the organization. The goals have not changed, the means for achieving the goals have changed because of new insights into how organizations function. This perspective was advanced by Harris (1976) when he stated, "The archaic notion of the lone supervisor, without status, disguised as just another teacher, will not suffice. This is an organized society in which lone individuals are doomed to be ineffectual" (p. 334).

What models are available for supervisors to adopt in their attempts to maximize the human potential of educational institutions? This paper will describe a management model which can provide a humanistic approach to supervision and presents findings from research that sought to establish whether the use of that modified management by objectives approach facilitates human growth and organizational success.

Management by objectives.

Management by objectives is a systematic means of isolating specific tasks to be accomplished by managers over an agreed time period. The basic philosophy has been described by Odiorne (1965) as

a process where the superior and subordinate managers of an organization jointly identify its common goals, define each individual's major areas of responsibility in terms of the results expected of him, and use these as guides for operating the unit and assessing the contribution of each of its members. (p. 26)

Peter Drucker (1954), the originator of MBO, described the proactive nature of the concept as follows:

it is management's specific job to make what is desirable first possible and then actual. Management is not just a creature of the economy, it is a creator as well. And only to the extent to which it masters the economic circumstances and alters them by conscious, directed action, does it really manage. To manage a business means therefore to manage by objectives. (p. 12)

In operational terms MBO refers to a process whereby superiors and subordinates meet and discuss goals (results) for the subordinates which are in line with organizational goals. Following this discussion the superior and subordinate jointly establish attainable goals for the subordinate. Once the series of objectives is specified and the resources are agreed upon, programs to meet the objectives are placed into operation and measurement of achievement is set for a predetermined date. Strategies for the improvement of performance are frequently stated. Several questions need to be answered when participants write performance objectives, e.g., What measurable change is to occur? What amount of time is allowed to accomplish the desired change? What is the minimum level of achievement allowable? At what point in time is the performance output to be measured and evaluated? Following the operation of the program, the superiors and subordinates meet to evaluate the subordinate's performance in terms of the goals.

A prime advantage of this approach is that subordinates know where they stand with regard to the contributions they are expected to make to the organizational unit and the system. It is expected that the process will result in improved employee and organizational performance, improved morale and attitudes of the participants, and reduced anxiety from job ambiguity. Since MBO involves an analysis of an employee's efforts in terms of clearly defined objectives and results, it is a more positive appraisal method. The subordinate becomes an active agent, rather than a passive object to be appraised. The accent is on performance which is directly related to organizational goals.

Research on MBO in Industry

Studies assessing the success of MBO in business organizations have been conducted for many years.

In a study conducted in 1965, Raia (Raia, 1974) cited increased awareness of organizational goals, improved communication and understanding of organizational purposes as positive outcomes of MBO. A follow-up study, however, showed that many of the participants felt that performance levels had not improved because of MBO.

Tosi and Carroll (1968) interviewed 48 managers involved in a work planning and review program. Generally positive reactions were noted relative to more objective performance evaluation, role clarification. In addition higher levels of performance and motivation were noted. They also noted that the subordinate's initial enthusiasm turned to disenchantment when the model was violated insofar as feedback relative to objectives was not given and superiors provided only surface support for MBO.

Ivancevich (1974) conducted an empirically-based longitudinal study of performance in a manufacturing company utilizing an MBO model. He assessed the performance of 181 supervisors in the production and marketing departments.

He noted that the success of MBO was enhanced by the use of memos, letters, and meetings. Improved performance by a majority of the supervisors was noted.

A comprehensive study by Stein (1975) surveyed 428 lower and middle management personnel in organizations where MBO had been in practice from two to five years. The study involved ten different organizations and sought answers to three research questions. The first question asked if MBO was inherently faulty. Stein found that it was not if the process was properly implemented and managed. Secondly he asked if substandard training and implementation procedures are the primary causes of failure. Results suggested that these factors were indeed important contributing factors. Thirdly, Stein investigated if the primary cause of failure was inadequate management attention. The study strongly supports this contention. Lack of appropriate review policies, unrealistic planning, and poor delegation of objectives were indicated as symptoms of ineffective management. A number of problems associated with MBO are outlined by Stein. These include (1) difficulty in writing meaningful objectives, (2) lack of follow-up and updating procedures, and (3) lack of commitment by upper management. Stein concludes that despite the criticisms stated by the participants, over 80 percent still favoured the retention of MBO.

In summary, studies in industry suggest that MBO is a viable management system for that sector. If it is to succeed, the manager must possess a high level of management skill, especially in the areas of goal setting, communication, and interpersonal relations.

MBO in Education

For the purpose of this paper MBO in education is defined as a disciplined communication process which relies heavily on an interview process, whereby all persons in an organization cooperatively express their hopes and aspirations for a stated period and rationalize them within the context of the overall goals of the corporation as stated by school officials.

Research on MBO in Education

From a review of the literature, it can be seen that MBO may be used successfully in education.

Fleming (1978) suggests that no one appears to disagree with the need to define objectives or to measure the results and modify programs accordingly. There exists an overall realization that educational effectiveness must be improved; there is a need for the schools to provide reasonable standards of achievement for students, particularly as it relates to literacy and basic computing skills.

Boston and Grove (1978) describe a results-oriented management system developed by the Indian Hill School District near Cincinnati, Ohio. The program involved most of the concepts which have been developed in this paper. In 1974 a qualified citizens' committee, appointed by the board of education, identified the following problems: (1) lack of long range goals, policies, and guidelines, (2) lack of budgetary procedures for monitoring and forecasting expenditures, (3) lack of definitive job descriptions that show individual responsibilities of staff members, (4) lack of a systematic and rational basis for the evaluation of programs, facilities, and staff, (5) lack of staff involvement in those decisions directly

affecting their responsibilities, and (6) lack of an organized program of staff development. A modified management by objectives approach was adopted. A program for the development of district goals was initiated. Similarly, a plan for the development of steps necessary for the attainment of the goals was established. A course of action for the attainment of each individual objective was developed which included initiation and completion dates, resources, activities, and tasks for each objective. It was understood that if the required condition for the completion of an objective changed, the objective would be modified accordingly. Provision was made for achievement to be reviewed on a regular basis. By 1976, it was felt that the problems identified earlier by the citizens' committee had been dealt with successfully.

In another article (Herman, 1978), the MBO system used in the West Bloomfield School District of Orchard Lake, Michigan is described. The major strengths and weaknesses of the process are discussed. The author concludes by stating

MBO is a useful tool if you use it wisely and establish your local districts modified system. West Bloomfield's students have benefitted by its use, and the management of many aspects of the district's administrative operation have improved from its use. (p. 83)

<u>What It Is</u>	<u>What It Is Not</u>
1. A clear statement of the major features of the job.	Based on out-of-date job descriptions or misconceptions.
2. A cooperative effort where the participants discuss goals to be achieved.	An annual or semi-annual special ceremony where everyone is ill at ease.
3. A commitment through participation where each individual is able to rationalize his own career expectations with goals of the organization.	Formal discussions where the individual is told by the superior the goals he is to reach.
4. A process where the goal setter is an active agent.	A process where the goal setter is a passive object.
5. A commitment for future action that will improve performance.	A review of past failures with directed solutions from the superior.
6. Measure of current performance.	Measurement of potential.
7. A positive approach to job analysis.	An accounting that stresses appraisal.
8. A potent way to motivate people through superior-subordinate interaction based on the belief that each individual knows his own capabilities better than anyone else.	A superior sitting in judgement on a subordinate, autocratic management based on the belief that superiors can judge performance of subordinates.
9. A process that leads to self-evaluation.	A process that motivates through fear.
10. A process that considers the development of human resources a primary means of achieving the objectives of the organization.	A process that stresses organizational patterns as the primary means of ensuring productivity.

Figure 1. Pros and cons of MBO in education.

Moberly and Stiles (1978) describe an MBO system which was used successfully in Seattle to assist the school board in addressing its primary tasks: long range planning, setting priorities, and evaluating the superintendent. The procedure used was as follows: (1) the superintendent delivered a report and a self-evaluation based on the goals stated by the board at the time of his appointment; (2) the board evaluated the superintendent; and (3) long range goals were reassessed and priorities set for the next year by the board and the superintendent.

In their assessment of the MBO system used in the schools of Hyde Park, New York, Gray and Burns (1979) conclude that where MBO has not lived up to expectations in education, some of the basic concepts, such as span of control, have been violated. These authors state that the most successful applications of the process have been with persons facing dismissal; in such cases very specific objectives were drawn up and followed and since the process was a matter of survival it was taken seriously. In general, the authors conclude that MBO holds great potential as a management tool that can bring benefits to students.

Figure 1 further exemplifies what MBO is and what MBO is not when applied to education.

A Research Study

As part of a movement to meet the need for more effective administration, the Carleton Board of Education in Ontario implemented a results-oriented management (ROS) system in 1974. For the purpose of this paper ROS will be defined as a cyclic process of growth modification which uses bilateral objective setting activity with prime emphasis on formative assessment. As indicated in this definition the process is designed to improve, not to prove. It assumes that the participants are professionals who are inherently motivated to improve their performance. This specific orientation to professional growth is a key to the process. By emphasizing the formative evaluation component and de-emphasizing the summative evaluation aspect, a climate of mutual trust and cooperation can be developed. The basic purpose of ROS is to improve the teaching and learning process in the schools. This is accomplished through the development of human resources in the system. The definition stresses that objectives are bilateral in nature for organizational objectives are dependent upon many others for completion and a sharing of objectives and constant review of accomplishments are necessary for progress.

Since its inception ROS has undergone several modifications to adapt to changing conditions, including evolution from a strictly individual goal-setting process to a procedure in which individuals set goals within the context of the total organization. The most significant aspect of the Carleton Board of Education project has been the application of the process to the classroom, in the form of results-oriented supervision. Results-oriented supervision is an effort to humanize the supervisory process and is viewed as a continuous process and not simply an inspection reporting procedure. The ROS process is in continuous operation. Gradual planned progress toward predetermined objectives is frequently assessed. The role of the supervisor becomes that of assisting the teacher in facilitating the achievement of the goals. Individual teacher objectives are shared by the supervisor who develops a commitment to the program. The cyclic nature of the process is stressed. New objectives are set and reviewed on a regular basis. The

process of formulating objectives, establishing procedures for meeting the objectives and evaluating the program becomes a major task of the school team.

The actual method involves three phases. Objectives are reviewed and set at a preconference, the process is implemented and monitored, and a postconference takes place to assess the results and restate objectives. It is hypothesized that the process will produce a high quality of instruction by a highly motivated staff and that the major benefit will be to students. It is further assumed that growth will pervade the entire school and school system.

In an effort to find out if the ROS process was indeed producing the intended results, a study of the supervisory program was commissioned in 1979. The purposes of the study were as follows: (1) to obtain information from teaching staff on progress in ROS, (2) to re-establish current needs and goals concerning ROS.

Methodology

The committee decided that data should be gathered from all participants in the ROS process; this included teachers, department heads, vice-principals, and principals. Data were to be collected by questionnaire and selected interviews. Since no questionnaire existed which would adequately measure the status of ROS, it was necessary to construct suitable instruments. Questions dealt with the actual process, ideal procedures for supervision, attitudes toward ROS, and perceptions of supervisory leadership. Each questionnaire was piloted with a small sample of the teachers and modifications made. The instruments were distributed to the participants during the latter part of the 1978-79 school year. The size of the sample is given in Table 1.

TABLE 1
RESPONSES TO QUESTIONNAIRES

Group	Number Mailed	Number Returned	% Returned
Elementary Teachers	358	255	71.2
Secondary Teachers	254	173	68.1
Department Heads	164	120	73.2
Vice-Principals	70	59	84.2
Principals	70	63	90.0
Total	916	670	73.1

Interviews with a segment of the population were conducted by researchers from the University of Ottawa. Information was also obtained in the interviews concerning strengths and weaknesses of the process which did not lend themselves to specific questions.

Results

In regard to the question, "To what degree are Carleton teachers involved in an ROS process?", the data indicate that 47 percent of the respondents were

utilizing ROS. The finding is significant on two counts. First, though the literature indicated that very few teachers set objectives for the improvement of job performance, these data indicated that almost half of the teachers in the Carleton system were involved in such a process. Secondly, the respondents indicated that assistance in writing purposeful objectives which contained the criteria for success had been provided and that they were improving in their ability to write meaningful objectives. The fact that 80 percent of the teachers who were involved in the ROS process found their supervisor to be helpful in facilitating the attainment of goals suggests that teachers were reacting positively to the supervisory assistance given by administrators.

In regard to the second research question, "Was the ROS process threatening to teachers?", it was found that 90 percent of the respondents who were utilizing the ROS process found the procedure to be nonthreatening. This is one of the most significant findings of the study since the literature suggests that most supervisory activities are threatening to teachers and that no other supervisory process received such acceptance. A major objective of the ROS process was being realized: a supervisory program had been implemented that was acceptable to professionals.

The third research question asked if the ROS process had improved job performance. The data indicate that 95 percent of the teachers who had participated in ROS felt that the experience had improved their job performance. The finding was substantiated by the principal data. This finding is significant to school administrators since it suggests that the ROS process can be used successfully to improve instruction.

In regard to the fourth research question, "What percentage of teachers reacted favourably to ROS?", it was found that over 90 percent of the teachers were satisfied with the ROS process. This finding is significant since most supervisory procedures produce a high level of dissatisfaction. A highly motivated staff was evident in the response rate. This fact was substantiated by the interviews.

Research question number five was designed to ascertain if the superiors involved in the ROS process were rated more favourably as persons and as supervisors than superiors not involved in ROS. Table 2 summarizes the findings.

TABLE 2
MEAN RATINGS OF SUPERIORS BY TEACHERS

Group Involved	Mean Rating of Superior	
	As a person	As a supervisor
Not involved in ROS at all	2.85*	3.65
Utilizing an ROS process	2.89	3.35

* Range of possible scores is 1-7. Low score indicates positive evaluation.

In most cases the individual was rated higher as a person than as a supervisor. In situations where the teachers were involved in ROS, the supervisor was rated

quite highly as a supervisor. These findings are significant to educators. Data of this study suggest that the best way to become known as a supervisor is to supervise. Related literature indicates that administrators are reluctant to supervise since it may jeopardize their relationships with teachers. Our data would not support this contention. Teachers in this study expected their superiors to perform a supervisory role and respected those who fulfilled this responsibility.

Department Heads. The specific research questions concerning department heads were

1. To what degree are department heads involved in an ROS process?
2. Were department heads being supervised by an ROS procedure?

In regard to the first question it was found that 75 percent of the respondents had identified lists of objectives for the improvement of performance of the teachers in their department. A surprising finding was that in only 55 percent of the cases had the objectives been established jointly by the department head and the teacher. In the other cases they were either a group decision or had been produced by only one of the participants. These findings are significant on several counts. Initially, the ROS process stresses the necessity of establishing the objectives jointly. In almost half of the cases this was not happening with the department heads. They were not following the suggested ROS procedure. It appears that many department heads were supervising as they had done previously only now they were calling it ROS. It is not surprising that most department heads were setting objectives for their subject areas as this is part of their job description; however, many were not working with individual teachers in establishing the objectives. Understandably, it is difficult to determine if individual teacher progress was made in achieving objectives.

In regard to the second research question, "Were department heads being supervised by an ROS procedure?" it was found that only 15 percent of department heads were being supervised in such a manner. Although almost 40 percent set objectives for the improvement of job performance, many of them had determined the objectives without consultation. Therefore the ROS process at the department head level had not been fully developed. Literature suggests that administrators tend to supervise as they are supervised. If administrators are not involved in an objective-setting process with their superiors they may not utilize such a procedure with their subordinates. In the Carleton study several reasons were given for the low utilization of an ROS process. Lack of time, lack of specific subject expertise, and the low priority allotted to supervision were most frequently mentioned.

Vice-Principals. All of the schools in the Carleton Board of Education have vice-principals, but their responsibilities vary. Some vice-principals teach full-time while others have no designated teaching responsibilities. Since this position has been traditionally a training position, it was assumed that many of the incumbents would be performing a supervisory role. The researchers wanted to ascertain if vice-principals were being supervised by their superiors utilizing an ROS process and if vice-principals were supervising teachers via an ROS procedure. Fifty percent of the respondents were being supervised by their principals using an ROS approach. A similar number reported that they were supervising teachers either on their own or in conjunction with the principal and using an ROS procedure.

Interview data supported the suggestion that vice-principals were attempting to implement the ROS process on a wide scale throughout the system. These findings are significant. If the ROS procedure is to gain wide acceptance in the

Carleton schools it must have the support of all levels. Vice-principals will be the main supervisors in the schools of the future. If they are utilizing an objective setting procedure in their training program, they are more inclined to use it when they become principals. A number of vice-principals were conducting seminars in their schools to acquaint teachers with the ROS process. This procedure appears to have potential as a staff development method at the vice-principal level.

Principals. During the introduction of ROS in Carleton, the principals were identified as pivotal to successful implementation. They had received approximately 40 hours of training in the procedure. Special training was given in the use of a results-oriented process as well as specialized workshops in objective-setting, interviewing, and areas in which objectives could be formulated. Had all of this planning resulted in implementation of ROS in the schools? Did principals perceive improvement of performance in teachers? What were the major strengths and weaknesses of ROS?

Results indicate that approximately one-half of the total teaching staff were being supervised with an ROS procedure. Several of the principals were utilizing ROS with the total staff. In other schools, principals were using ROS with selected teachers. Many schools have implemented ROS during the current school year. These findings indicate that the process was successfully implemented in the system. Earlier studies had suggested that very little supervision was taking place in the schools.

With regards to the second question, "Did principals perceive improved performance by teachers?", 90 percent of administrators indicated that the process resulted in an improvement in job performance of the teachers. This finding was supported by the teacher data. As indicated earlier this finding is significant in that it is difficult to find an alternative supervisory procedure in today's schools which receives such a vote of confidence. As well as being accepted by teachers, it results in perceived improvement of performance.

What were the major strengths and weaknesses of the ROS process? All of the principals reported that the procedure encouraged and facilitated planning. Most reported that the process established better communication with staff and enhanced professional growth of teachers. Fifty percent of the principals stated that the process was providing measurable benefit to students. The weaknesses reported by principals involved procedural and administrative problems. Many found the objective setting process to be very time consuming. Others reported that teachers were having difficulty setting purposeful objectives and needed additional assistance. Several indicated that from the principal's perspective it was difficult to identify student benefit. A few principals indicated that the process was weakened by a lack of commitment on the part of their superiors.

The problems identified in the study do not suggest inherent weaknesses in the results-oriented process. They indicated the need for an ongoing inservice program to facilitate implementation. The question of time will always be a factor in any administrative response. Supervision is a top priority for school principals and time must be found for this function. It was noted that some of the principals who were using the ROS process with the total staff did not report time as a difficulty.

Summary

A survey of several large school systems in 1972 reported by Saxe stated that to all intents and purposes there was no supervision taking place in the

elementary schools. Data indicate that this is not the case in the Carleton Board Schools. The research questions investigated the degree of involvement, reaction of participants, and their perception of the effectiveness of a results-oriented supervisory process. Approximately 50 percent of the teaching staff in the Carleton Board of Education are being supervised using a results-oriented approach. The process is perceived as non-threatening by almost all participants. ROS is perceived by teachers to assist in improving job performance. A considerable number of department heads were utilizing an ROS procedure with the teachers in their subject areas. In several instances the procedures followed did not represent the original program implemented by the administration. For example, many of the department heads had established the objectives on a group basis. Therefore the process was of limited value in supervising individual teachers in the department. Only a small number of department heads were being supervised by their superiors via the ROS procedure. With regard to vice-principals, approximately 50 percent were involved with a results-oriented approach to supervision. Several were carrying out the process in conjunction with principals. In addition, almost half of the vice-principals were being supervised by their principals using an ROS approach. Principal data supported the results obtained from the other participants. The principals were utilizing ROS with approximately half of the teaching staff. Ninety percent of the principals indicated that the process resulted in improvement in job performance of the teachers. This group also perceived the process to be nonthreatening to the participants. All of the principals reported that ROS encouraged and facilitated planning. In addition most indicated that ROS enhanced communication with staff and encouraged professional growth of teachers. Fifty percent of the principals stated that the process provided visible benefit to students. Weaknesses of the ROS process appeared to centre upon time constraints and administrative problems.

Conclusion

Results of a study in the Carleton Board of Education suggest that a modified management by objectives process has considerable potential for education. A results-oriented approach to supervision has been successfully implemented in the system. The procedure facilitates the development of the human resources within an educational institution. Results-oriented supervision enhances the feelings of identity, commitment and motivation necessary for creating growth in a professional organization. Results-oriented supervision facilitates a team approach to administration in schools. Recent research would indicate that participatory management is no longer an option. Organizations which are adapting to the changing needs of society must develop the concepts inherent in participatory management. A modified management by objectives holds great potential for implementing a participatory approach to management. Such a procedure recognizes the expertise of a professional staff and facilitates growth in individuals and in the total organization.

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RESEARCH NOTES

ARE CANADIANS PENALIZED BY THE INFORMATION SUBTEST OF THE WAIS?

The Information subtest of the Wechsler Adult Intelligence Scale (WAIS) contains 29 items, 8 of which have a distinct American content (items 1, 6, 9, 11, 14, 17, 20, 21). In the experience of the present authors, Canadians who take this subtest regularly express dismay at the American content of the items. The purpose of the present study was to ascertain whether or not the American content of these eight items results in depressed subtest scores for Canadian test-takers.

Tsushima and Bratton (1977) noted that there has been a paucity of research evidence on the possible effects of geographic location and sociocultural milieu upon WAIS scores. In their study, Hawaiian psychiatric outpatients were found to perform significantly worse than U.S. mainland psychiatric outpatients on the Vocabulary, Comprehension, Similarities, Information, and Digit Span subtests of the WAIS. It appears then, that differences in the sociocultural milieu of these patients have affected their WAIS scores.

In the present study, 47 adult Canadians (all held Canadian citizenship) were randomly assigned to take one of two versions of the Information subtest of the WAIS. One version was the standard scale (American version) while the second was "Canadianized" (Canadian version) by changing the eight items with American content as follows:

- (1) What are the colours of the Canadian flag?
- (6) Name four men who have been prime ministers of Canada since 1900.
- (9) In what direction would you travel if you went from Toronto to Panama?
- (11) How tall is the average Canadian woman?
- (14) When is Queen Victoria's birthday?
- (17) How far is it from Paris to Toronto?
- (20) What is the population of Canada?
- (21) How many Members of Parliament are there in the House of Commons?

All other items were identical. Twenty-three subjects (48.9% of the sample) received the American version while 24 (51.1% of the sample) received the Canadian form.

A one-way analysis of variance was performed on the total subtest scores and revealed no significant differences between the subjects' performance on the Canadian or American versions of the subtest ($F=0.703$; $df=1,45$; $p=0.4064$). The mean score on the American version was 21.09 (SD=3.59) while on the Canadian version it was 20.13 (SD=4.24). An item analysis, however, demonstrated that subjects' performance was significantly different ($X^2=14.34$; $df=1$; $p=0.0002$) on item 6. Interestingly, on this item, subjects were able to name four past presidents of the United States more readily than they were able to name four prime ministers of Canada.

Although this study was limited due to the relatively small number of subjects, it does give some indication that Canadian test-takers' scores on the Information subtest of the WAIS may not be depressed due to the American content of eight items.

Gurmal Rattan
Morag Gornall
and
Claudio Violato
The University of British Columbia

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BOOK REVIEWS

CANADIAN AND COMPARATIVE EDUCATIONAL ADMINISTRATION. Edited by Robin H. Farquhar and Ian E. Housego. Vancouver: University of British Columbia, Publications Division, Centre for Continuing Education, 1980, 403 pp., \$15.00 (Canadian).

The Commonwealth Council for Educational Administration is an Australia-based organization which has initiated a series of international visitation programmes for scholars and others with an interest in the field of educational administration. These events have occurred at four-yearly intervals, in different parts of the world, and include, besides the rather opaque activity of visitation, the preparation and delivery of formal papers. This book is a compendium of papers from the 1978 Canadian Conference. It is well-edited, which is to say that it is heavily edited, and an attempt has been made to superimpose a logic by organizing the contributors under the heads of The Administrator as Mediator; Problems and Trends in the Field of Educational Administration; Contemporary Issues in Training Educational Administrators; Promises and Limitations; and The Future Study of Educational Administration. These sections are preceded by a prologue dealing with Leadership for Educational Administration in Canada and succeeded by an epilogue on The Contemporary Predicament. Of the 31 authors about a third are Canadian and the national allegiance of the rest would include not only the Commonwealth (Australia well represented) but also the United States, Europe, and Latin America. Motley perhaps, but certainly evidence of universality and motleyness in itself is a commendation rather than a criticism in a work of this kind. Unfortunately, some readers might be deterred by the range and variety of topic and focus which constantly serves to weaken the editors' bid for thematic coherence. That coherence is *supposed* to be about "the contemporary role of the educational administrator as a *mediator* among various internal and external forces that influence the formulations and implementation of policy." But such a theme is so broad, vague, even banal that it affords, to put it positively, the opportunity to talk about anything or everything of interest to practitioner or theoretician. There is just too much grist for the mill.

Perhaps as a consequence of this, the articles are highly variable in style, content, and quality and it would be insidious and imprudent for a reviewer to single out specific authors for the receipt of praise, blame, or rank-ordering. It

must be noted, however, that many of the contributors bear names of eminence in the field and these include, without prejudice to colleagues not cited, William Taylor and Meredydd Hughes from the United Kingdom, William Walker and Grant Harman from Australia, Per Dalin from Norway, and Jack Culbertson and Jacob W. Getzels from the U.S. Taken together, the contents of the book provide an interesting and impressive collection of international concerns and issues in educational administration *circa* 1978. It thus constitutes a useful source book in comparative administration and justifies its title. At the same time it provides direct evidence of the fuzzy and amorphous nature of the discipline of administration and argues for the more correct classification of that study as an applied interdisciplinary nexus, a confluence into which many streams of information may pour and to which all of the social sciences and humanities can contribute.

It may be a source of regret to some, though only an oblique criticism of the book, that the resounding theme which emerged from the predecessor conference — the intellectual controversy giving rise to the ongoing polemic between social science and phenomenology and all the exciting shot and shell of the Greenfield-Griffiths dialectic — was rather studiously ignored in the successor conference. As if the genie freed from the bottle before could now be subsequently discounted. Yet reference to that debate occurs nevertheless, even if *en passant*, in the papers of three of the contributors.

In sum, this is a well-edited survey of contemporary issues in educational administration across the world. It is intellectually bland and non – controversial. A valuable fund of information is presented but little to arouse and stir the mental appetites and passions; wisdom, if it is there, and it probably is, must be mined from the ore of pragmatism. The concept of administrator as mediator amidst a mess of contending circumstances and forces, not a very helpful concept to begin with, remains in less than sharp and crystalline focus at the end. But one can enhance one's sophistication about the mess by reading this book.

Christopher Hodgkinson
Faculty of Education
University of Victoria

BEHAVIOUR THERAPY WITH HYPERACTIVE AND LEARNING DISABLED CHILDREN. By Benjamin B. Lahey. New York: Oxford University Press, 1979, 260 pp., \$15.95 (hardbound), \$8.95 (cloth).

Perhaps no other area of exceptionality has generated as much controversy than has learning disabilities. Today, some 15 years after the term "learning disability" was coined, there is little agreement among professionals concerning either the nature of learning disabilities or effective methods of assessing and remediating learning and behavior problems. This continuing controversy is the subject of Lahey's text, whose purpose is to examine the various theoretical approaches and to determine whether "we now possess a technology for effectively dealing with learning and behavior problems" (p. v).

The text consists of an introduction followed by three sections, each of which contains readings reprinted from journal articles. A brief historical overview of the field is provided in the introduction, in which the past 20 years are divided into three “eras.” Each era corresponds to a “paradigm shift” or a time when new conceptualizations or methodological advances significantly altered the way learning and behavior problems were viewed.

In Section I, Lahey examines the research evidence on the effectiveness of treatment approaches stemming from first paradigm (perceptual-motor, psycholinguistic, and neurological) theories. Also included in this section are review articles on the effects of stimulant medication on hyperactive behavior. The second and third paradigm approaches toward the treatment of learning and behavior problems are presented in Section II. These two paradigms are similar in that they both focus on direct remediation of observable behavior problems; they differ with respect to the selection of the behavior to be modified. While the second paradigm focuses on reducing inappropriate behaviors which are thought to interfere with learning, the latter paradigm emphasizes reinforcing accurate responding to increase academic performance and to decrease inappropriate behaviors. Ten research articles representing second and third paradigm behavioral approaches are presented in this section, dealing with such topics as: direct instruction, cognitive behavior modification, biofeedback, and self-instruction. The final section of the text contains three articles which contrast the effects of stimulant medication and behavioral management techniques for controlling hyperactive behavior.

Lahey presents a convincing case for abandoning first paradigm approaches, which emphasize remediating presumed underlying disabilities, in favor of a behavioral approach. His position is clearly supported by the lack of research attesting to the effectiveness of first paradigm treatment methods and on the consistently positive effects associated with the behavioral approach. Although Lahey advocates the use of a behavioral approach, he evaluates it with the same objectivity used to assess first paradigm theories.

This text is by far the most authoritative source on the effectiveness of various approaches in the field of learning disabilities. It is both a welcome addition to one’s professional library and an excellent text for a graduate level course on theories of learning disabilities.

Colleen S. Blankenship
Department of Special Education
University of Illinois at Urbana-Champaign

THE DEVELOPMENT OF MODAL REASONING. Genesis of Necessity and Possibility Notions. *By Gilberte Pièraut-Le Bonniec.* New York: Academic Press, Inc., 1980, 171 pp., \$16.50.

The Development of Modal Reasoning is an experimental research essentially influenced by Piaget’s findings on the development of intelligence. Except for Chapter 4 which was rewritten because of new experimental data, the work is a

translation of "Le Raisonnement Modal: Etude Génétique." In this work, Piéraud-Le Bonniec deals with "the genesis of this all-encompassing need for logical thought, and for this ability of thought to question itself" (p. ix) and how "children construct the notions that they use to organize their own thoughts into coherent systems of truth values" (p. 2). In essence, the author feels that while "Piaget has dealt primarily with the genesis of logicomathematical thought" (p. 2), "other forms of reasoning develop parallel to the logic of formal operations acquired in adolescence" (p. 2). One of these is the use of modal notions such as possibility and necessity, certainty and uncertainty, probability and impossibility. In this study we find a description of "the observable states in the child's use of modal notions" (p. 3). An attempt is made to construct a model that would account for the organization of these notions in thought, but as the author puts it, the model which is hypothetical needs more time for validation. She explains it thus:

The notion of eventuality arises from an initial system of pragmatic modalities. The notion of eventuality would be the point of attachment for the organization of the system of epistemic modalities to know that; to not know if. The notion of undecidability would result from the system of eventualities and the epistemic modalities. This notion in turn, would be the point of attachment for the construction of alethic modalities by coordinating the necessary and the hypothetical. (p. 153)

In chapter 1, the author gives us a briefing of the different fields that have studied modal aspects of thought and, in so doing, presents elements giving us a more complete definition of "modalities." We find ourselves reviewing some parts of syntax in the field of language, followed by classical and medieval studies of modality with the structural organization of modal notions: the square of oppositions; the difficulties of the implication relation, and the distinction necessary between "de re" and "de dicto" modalities. We are then introduced to mathematical logic. These modalities are grouped under a "question of alethic modality." A section called Extensions of the notion of modality gives us a comparison of Alethic, Epistemic, Deontic, Existential, etc. modalities. The chapter concludes with the relationship of and difficulties with modality and quantification.

Chapter 2 begins with a summary of chapter 1. After the summary, the concept of truth is elaborated, i.e.,

The sense of truth within man's reach plays in fact a double role: on the one hand, the ability to discover truth relations permits action in both time and space; on the other hand, the search for evidence orients reasoning and the thought process. This could thus explain the unity underlying the various aspects of modality. (p. 41)

Since philosophers had studied modality prior to the advent of psychology, the author looks at how they approached the different aspects, which brings her to reviewing some theories of knowledge (Descartes, Socrates, Kant, Locke). This is followed by the contribution of experimental psychology to the modal aspects of reasoning. Here the author identifies clearly genetic psychology as the only appropriate method for her research. She then summarizes Piaget's stages of intellectual development and criticizes the theory, mainly the implication problems in the INRC groups.

One comment made by the author, "The use of two-valued logic as a model in psychology precludes an explanation of important aspects of natural thought" (p. 56), leads to the following question: "Can modal logic furnish a better descriptive model of the operations of thought?" At this point she introduces L. Frey's analysis of Piaget's and Inhelder's, "the billiard games."

We are now ready for the author's hypotheses:

1. The important role played by "possibility" and the existence of a form of hypotheticodeductive thought before adolescence.

2. That modal logic would be made appropriate as a means of understanding the acquisition of logical necessity.
3. The sentiments of logical necessity could arise from the simultaneous consideration of observable cases of possibility and impossibility.

The model used is based on the logical square of modalities including those modalities concerned with the truth value propositions encountered in linguistics and semantics.

Chapters 3, 4, and 5 describe the experiments used to verify these hypotheses and the conclusions obtained. The subjects for these experiments were chosen according to the three stages of intellectual development defined by Piaget. The experiments are presented in two parts: Part I — presentation of material which could be used to make certain objects; Part II — objects made from the material.

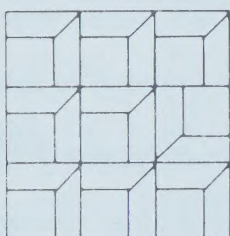
It is difficult to evaluate the experiments performed since the author does not say how the subjects were chosen, i.e., what the criteria were regarding deciding what stage a child was really at, if the cultural background of the child was an important factor or if this was random choice, etc. The number of students for each experiment also varies, which leads us to believe that different subjects were chosen for each experiment.

This would appear to be an interesting study for those involved in the field of Developmental Psychology. The author has answered some of the questions asked at the beginning of this text, such as the importance of necessity and possibility in the solution of problems. She has also opened the path for more research in this area. Even though her model is still in a developmental process, it provides a tool for future research. This study also offers some answers to Piaget's critics. As Piéaut-Le Bonniec suggests, a new model could be developed to explain the transformation observed in the genesis of the modalities of reasoning.

In the conclusion, Chapter 6, the author realizes that in the organization and utilization of modal notions there is an order which refers to the law governing the different ages and stages. (Each stage constitutes a necessary if not sufficient condition for the advent of the succeeding stage.)

This is an interesting book. Piéaut-Le Bonniec's writing style upholds interest in what appears to be a complicated subject. However, the observations described are acts of everyday living which are simple and might leave the reader with the question: Was something new discovered in this study?

Evelyn Gagné
Educational Counselling
University of Ottawa



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